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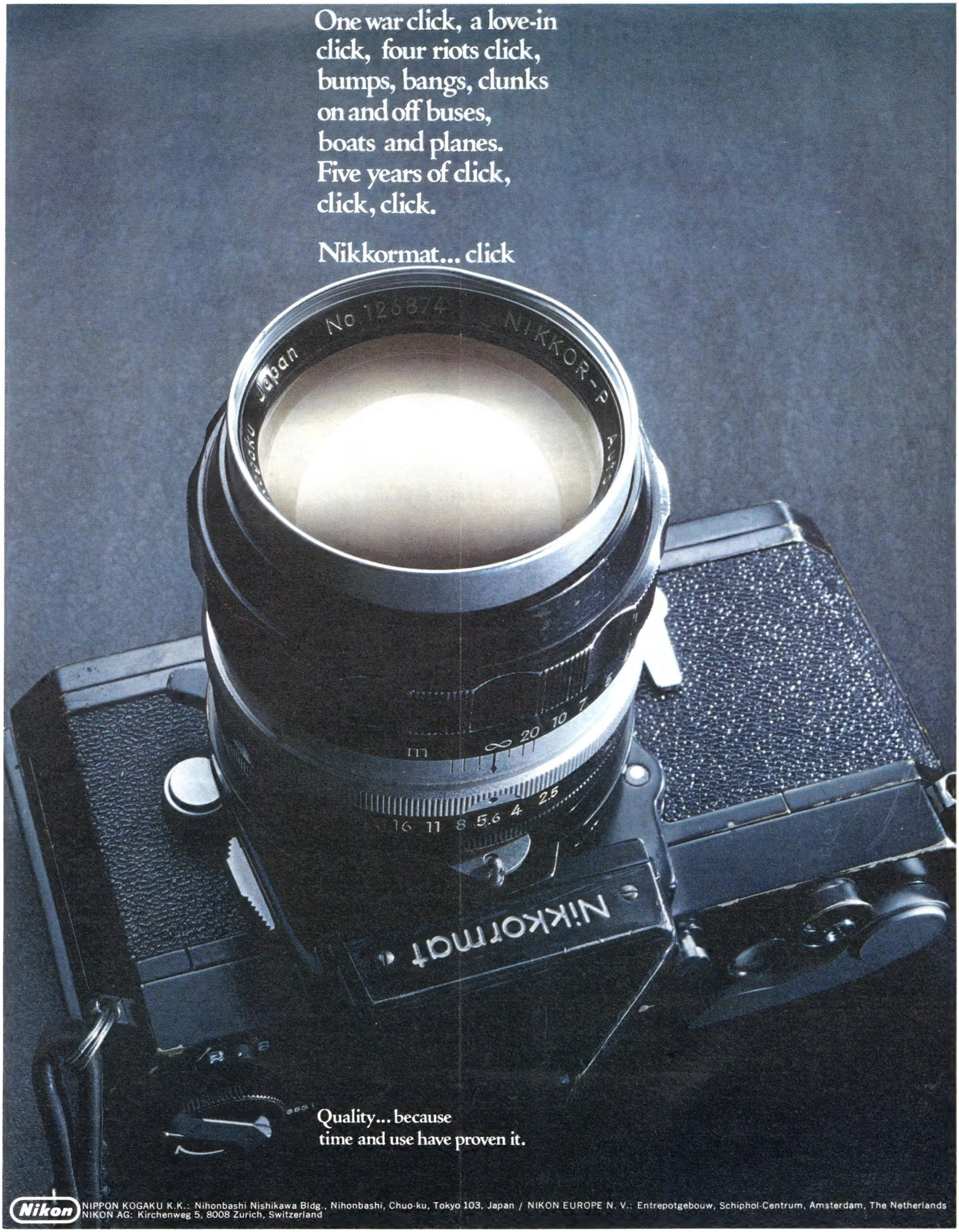

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LIFE

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Once, when the new world lay undiscovered by the old, man believed his most challenging mission on earth to be the conquest of its last frontier. Now as man once again thrusts outward, into space, he is beginning also to comprehend more fully the vital need not to conquer but to conserve the all-too-finite environment of his own planet. This issue of LIFE is dedicated to that comprehension. In the words of the late Adlai Stevenson:

> "We travel together, passengers on a little spaceship, dependent on its vulnerable reserves of air and soil; all committed for our safety to its security and peace; preserved from annihilation only by the care, the work and, I will say, the love we give our fragile craft."

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GUEST PRIVILEGE

RENÉ DUBOS

Mere survival is not enough for Man

I am tired of hearing that man is on his way to extinction, along with most other forms of life. Like many others, I am alarmed by the destructive effects of our power-intoxicated technology and of our ungoverned population growth; I know that scientists have even worked out a specific timetable for the extinction of mankind. But my own view of man as a biological animal suggests that something worse than extinction is in store for us.

Man will survive as a species for one reason: He can adapt to almost anything. I am sure we can adapt to the dirt, pollution and noise of a New York or Tokyo. But that is the real tragedy—we can adapt to it. It is not man the ecological crisis threatens to destroy but the quality of human life, the attributes that make human life different from animal life.

Wild animals can survive and even multiply in city zoos, but at the cost of losing the physical and behavioral splendor they possess in their natural habitat. Similarly, human beings can almost certainly survive and multiply in the polluted cage of technological civilization, but we may sacrifice much of our humanness in adapting to such conditions.

The dangers inherent in adaptability were dramatically shown by the illustrious French bacteriologist Louis Pasteur in a lecture to students of the Ecole des Beaux Arts in Paris, in 1864. Pasteur pointed out that most human beings crowded in a poorly ventilated room usually fail to notice that the quality of the air they breathe deteriorates progressively; they are unaware of this deterioration because the change takes place by imperceptible steps.

Then, to illustrate the danger of such adaptation to an objectionable environment, Pasteur placed a bird in a closed container and allowed it to remain in the confined atmosphere for several hours. The bird became rather inactive but survived. In contrast, when a new bird of the same species was introduced into the same cage where the first bird remained alive, it immediately died.

The precise interpretation of this experiment is complex, but the lesson is clear. Like animals, men tend to make some form of adjustment to dangerous conditions, when these develop slowly without giving clear signs of the deleterious effects. Paradoxically, most of the threatening situations we face today have their origins in the immense adaptability of mankind.

The worst effects of environmental pollution are probably yet to come since it is only during recent decades that certain chemical pollutants have reached high levels almost everywhere and that children have been exposed to these pollutants almost constantly from the time of birth.

But the quality of the environment cannot be measured only in terms of gross defects such as air, water or food pollution. Environmental conditions experienced early in life (including the formative months before birth) cause the most profound and lasting changes in man. But human beings continue to be shaped by their environment throughout their lives. What we call humanness is the expression of the interplay between man's nature and the environment, an interplay which is as old as life itself and which is the mechanism for creation on earth.

Rational and blasé as we may be, and scornful of any thought that there is a "ghost in the machine," we still believe deeply that life is governed by forces that have their roots in the sky, soil and water around us. And there is, in fact, a profound biological basis for this belief. Many basic biological rhythms in man, such as body temperature, hormone secretion, blood pressure, vary with the seasons or other cosmic forces. Some of man's deepest biological traits are governed by the movement of the earth around the sun, others are connected with the movement of the moon around the earth and still others result from the daily rotation of the earth on its axis. All of these fluctuations in biological characteristics probably derive from the fact that the human species evolved under the influence of cosmic forces that have not changed. These mechanisms became inscribed in the genetic code and persist today even when they are no longer needed under the conditions of modern life.

We have retained so many behavioral traits inherited from our Stone Age ancestors that, according to Dr. David Hamburg, professor of psychiatry at Stanford University, the best relic we have of early man is modern man.

The survival of the distant past in human nature manifests itself at almost every moment of our daily life. We build wood fires in steam-heated city apartments; we keep plants and animals around us as if to maintain direct contact with our own origins; we travel long and far on weekends to recapture some aspect of the wilderness from which our ancestors emerged centuries ago. When we can afford it, we go back to hunting, first using guns, then bows and arrows; very soon, I am sure, we shall use spears armed with points that we shall fashion from stones with our own hands—not out of necessity, but as a symbol of return to the Stone Age.

Our genetic makeup and therefore our most basic needs are still essentially the same as those of the Paleolithic hunters from whom we originated. Those early hunters moved freely among trees and grass, streams and rocks, tame and wild animals. They engaged in occupations which were at times dangerous and which always sharpened their wits. They had to make decisions on their own, rather than being entirely programmed for a limited social role. The maintenance of biological and mental health requires that technological societies provide in some form the biological freedom enjoyed by our Paleolithic ancestors.

The primordial habitat in which the human race evolved still shapes man's most basic responses in adapting to conditions of modern life. Our reaction to crowding and to strangers, our sense of social order, even our forms of conflict, are conditioned by deep imprints from the biological past. A human environment must allow ways for man to express his aboriginal nature, to satisfy those needs that are rooted in the Stone Age, however great the outward changes brought by urbanization and technology.

Ecologists and medical scientists have been chiefly concerned with the undesirable effects of the physical environment of man. But the creative aspects are more interesting and more important in the long run. The problem of the environment involves the salvation and enhancement of those positive values which man uses to develop his humanness. It involves, ultimately, a social organization in which each person has much freedom in selecting the stage on which to act his life: a peaceful village green, the banks of a river, the exciting plaza in a great city. Survival is not enough. Seeing the Milky Way, experiencing the fragrance of spring and observing other forms of life continue to play an immense role in the development of humanness. Man can use many different aspects of reality to make his life, not by imposing himself as a conqueror on nature, but by participating in the continuous act of creation in which all living things are engaged. Otherwise, man may be doomed to survive as something less than human.

René Dubos heads the Department of Environmental Bio Medicine at Rockefeller University. His *So Human an Animal* won a Pulitzer prize.

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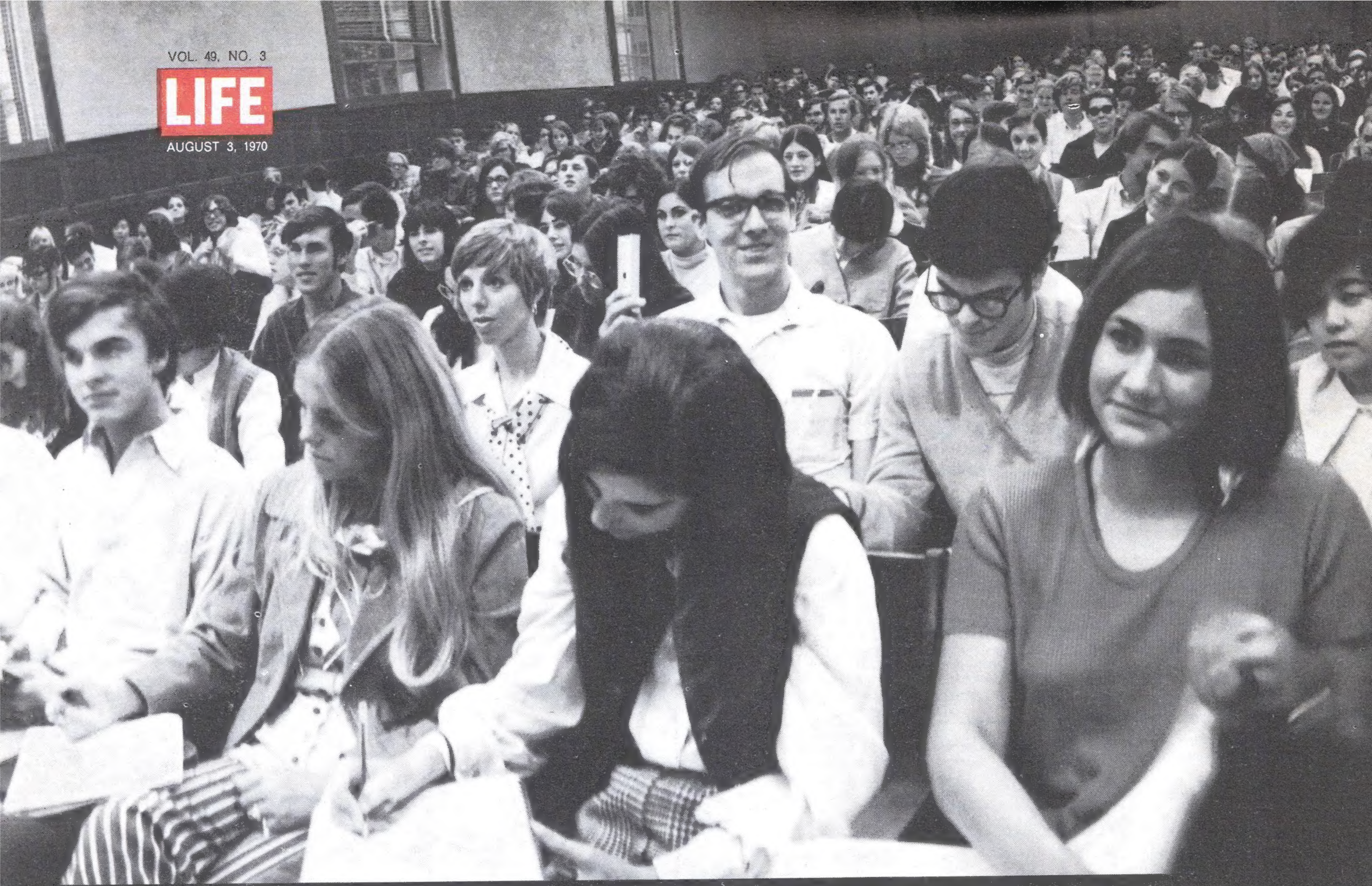
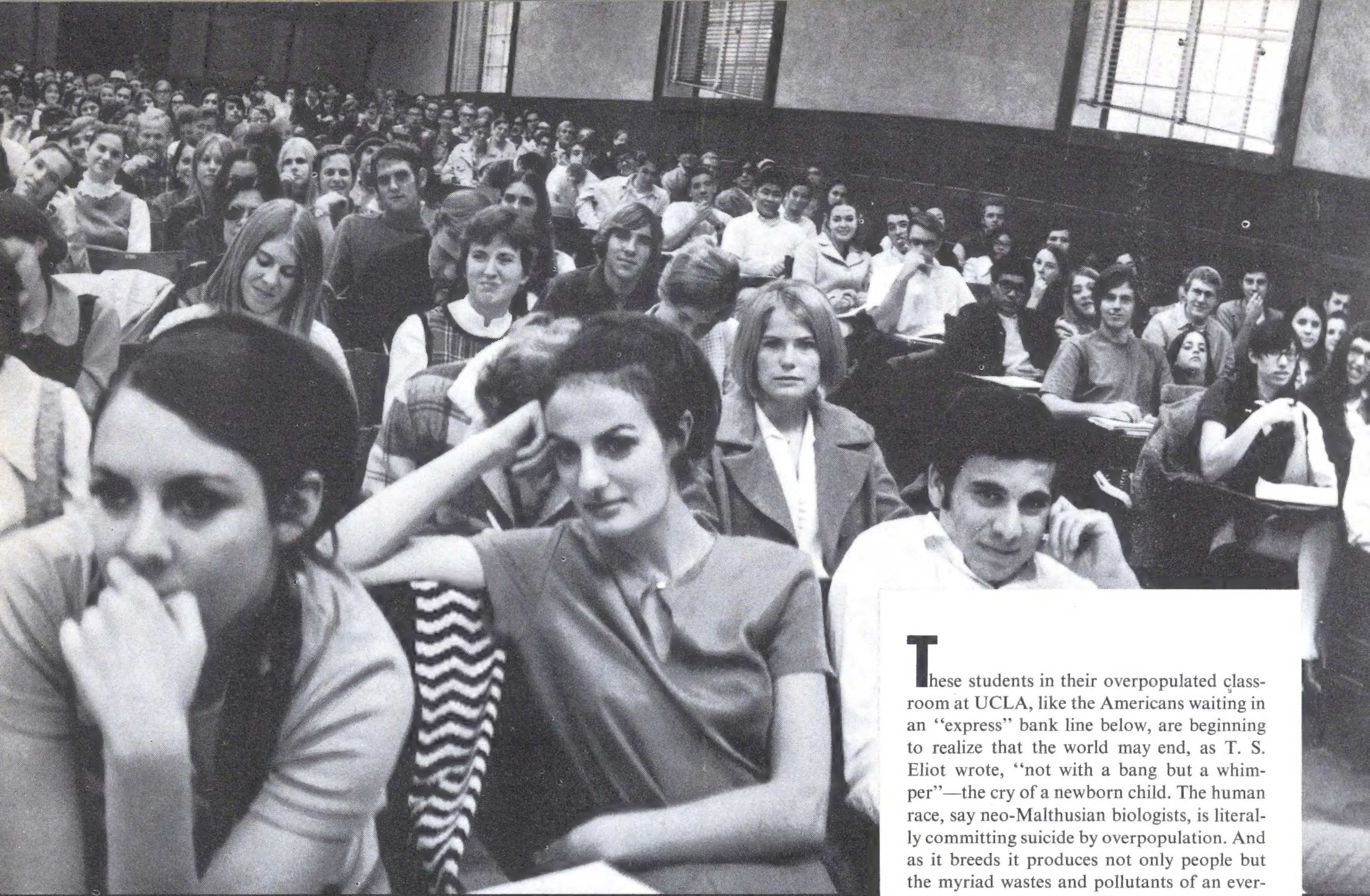


PEOPLE FIND OUT PEOPLE ARE THE



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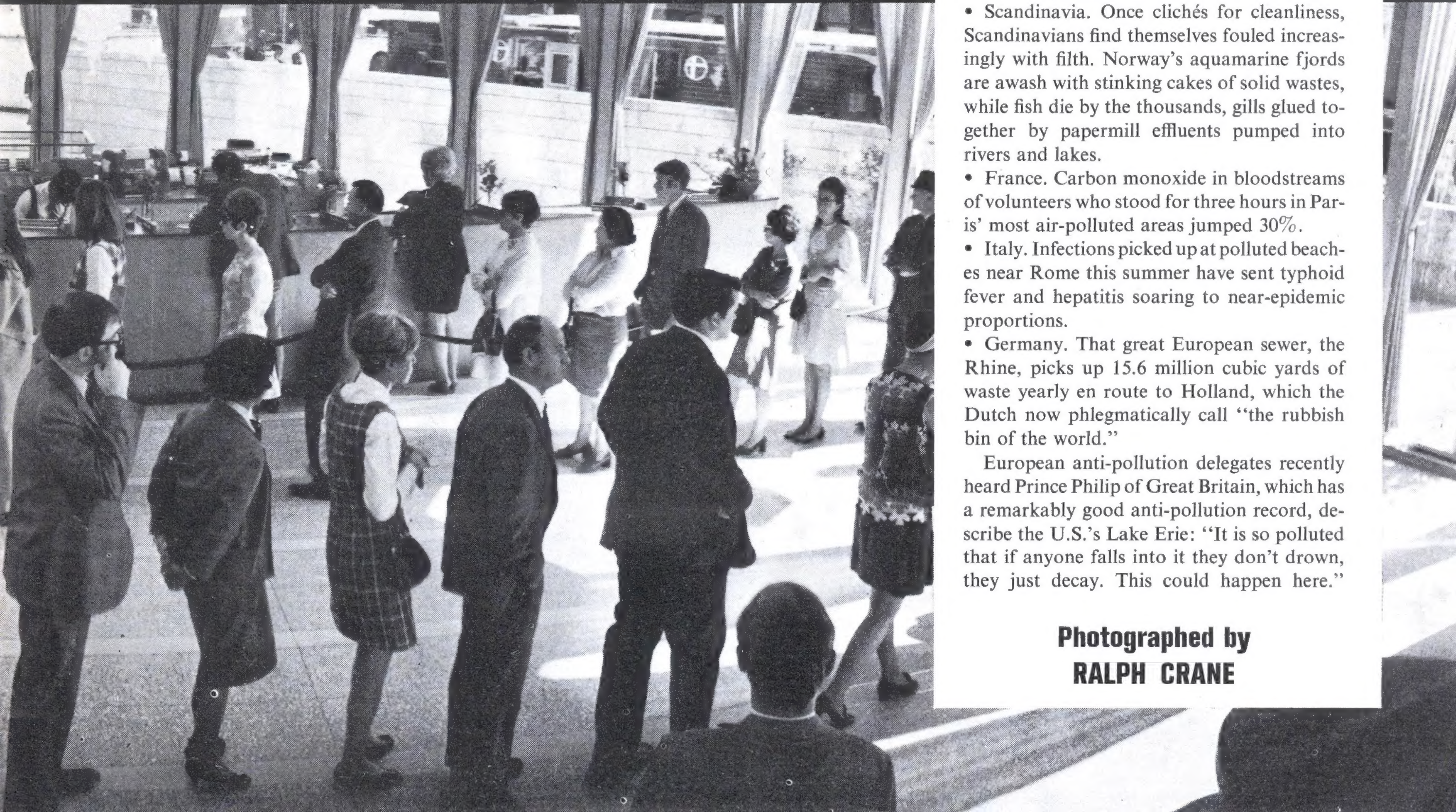


These students in their overpopulated classroom at UCLA, like the Americans waiting in an "express" bank line below, are beginning to realize that the world may end, as T. S. Eliot wrote, "not with a bang but a whimper"—the cry of a newborn child. The human race, say neo-Malthusian biologists, is literally committing suicide by overpopulation. And as it breeds it produces not only people but the myriad wastes and pollutants of an evermore-industrialized world. They in turn dangerously unbalance the intricate series of ecosystems which keeps the world alive.

In Europe, environmental pollution has become a supranational crisis:

- Scandinavia. Once clichés for cleanliness, Scandinavians find themselves fouled increasingly with filth. Norway's aquamarine fjords are awash with stinking cakes of solid wastes, while fish die by the thousands, gills glued together by papermill effluents pumped into rivers and lakes.
- France. Carbon monoxide in bloodstreams of volunteers who stood for three hours in Paris' most air-polluted areas jumped 30%.
- Italy. Infections picked up at polluted beaches near Rome this summer have sent typhoid fever and hepatitis soaring to near-epidemic proportions.
- Germany. That great European sewer, the Rhine, picks up 15.6 million cubic yards of waste yearly en route to Holland, which the Dutch now phlegmatically call "the rubbish bin of the world."

European anti-pollution delegates recently heard Prince Philip of Great Britain, which has a remarkably good anti-pollution record, describe the U.S.'s Lake Erie: "It is so polluted that if anyone falls into it they don't drown, they just decay. This could happen here."

Photographed by
RALPH CRANE

The role of the individual in a mass-oriented society is obscure.

Getting Away from It All Brings It Back

Skiers, searching for the great outdoors, find it already occupied.

Reward for half hour's wait on a crowded Disneyland float is a 7-minute ride in a packed canoe.

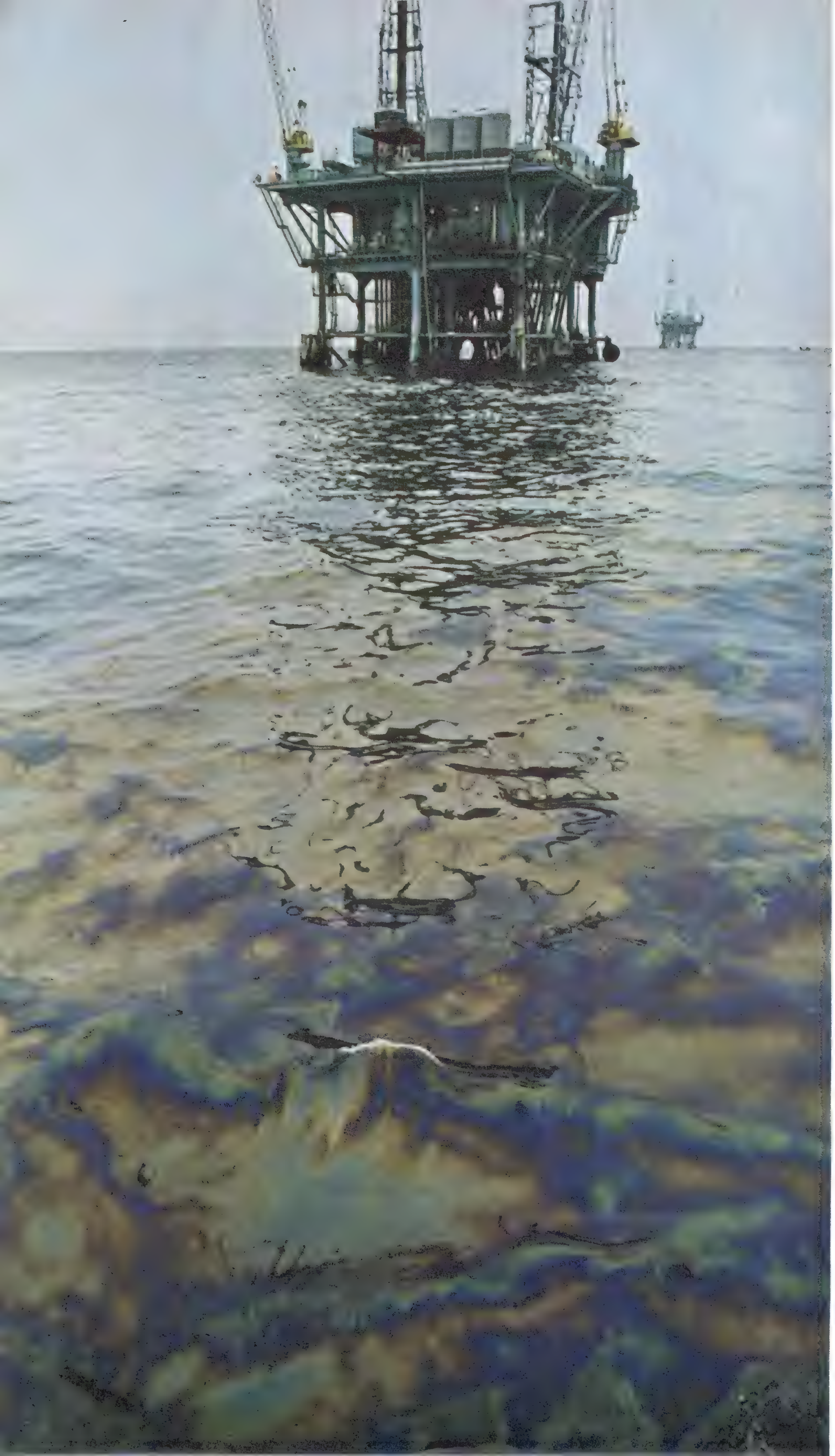
Easy Come, Hard To Go, Young and Old

A day's production undergoes final inspection before rolling off assembly line.

in a Row

Aged patients retreat to quarters after lunch in their next-to-last resting place.

Gushing rewards



Five miles off the coast of Santa Barbara, California, an iridescence coats the sea in the aftermath of an oil well blowout in 1969 which spewed almost a quarter of a million gallons of crude

from petroleum conceal the hazards of pollution

OIL'S IRIDESCENT PERILS

oil onto adjacent and distant waters and shores. More than a year after the explosion, oil is still leaking from faults in the ocean's floor and despite efforts to trap it in huge tents it is still reaching Santa Barbara's beaches. Above, on San Miguel Island, 35 miles from the blowout site, an infant sea lion—himself stained by the spillage—surveys his threatened domain.

Oil is the single greatest pollutant on earth. When one tanker, the *Torrey Canyon*, hit a reef off the southwest corner of England on a gray March morning in 1967 she spilled 119,000 tons of oil, enough to run an automobile 9,400 times around the world, devastating almost 200 miles of Cornish and Breton beaches. Even more significantly, however, the *Torrey Canyon* disaster aroused a general awareness that oil pollution alone could destroy man's seemingly fail-safe 20th Century culture.

Petroleum threatens the earth's environment from the moment crude oil leaves the wellhead until it enters the atmosphere in gaseous effluents and is unavoidably drawn into human lungs. In offshore drilling for oil a bit may puncture a natural fault in the ocean floor and release huge and virtually uncontrollable outpourings of petroleum like those which destroyed marine life and blotted beaches off Santa Barbara, California in 1969. Or drillers on offshore platforms may ignore or violate safety regulations and permit a pressure blowout at the wellhead, which often leads not only to oil spills on the ocean surface but to huge fires which further pollute the atmosphere.

Oil shipped from drilling sites by the 5,000 tankers now hauling more than 600,000,000 tons of crude oil per year could produce another *Torrey Canyon*. Attempts to clean up after another disaster could kill more marine life if poisonous detergents were sprayed on the ocean to dissipate the oil.

Oil transported by pipeline can become even more perilous to the environment. The proposed 800-mile-long Alaska pipeline, carrying oil at an estimated 150 degrees Fahrenheit (only about 10 degrees cooler than wellhead temperature), could melt the permafrost beneath an aboveground line or above a buried line and turn thousands of square miles of tundra into a quagmire. A break in the line itself (it runs through earthquake country) could release as much as 200,000 barrels of oil, making the Santa Barbara spill look like a carburetor

CONTINUED

Leaving smoggy New York at day's end each motorist takes home a private pollution system: his automobile.

CONTINUED

leak. Finally, if the pipeline were built aboveground it would impede movement of caribou and other animals which normally migrate across its projected course, destroying the ecological balance of the entire region.

Once crude oil reaches one of the world's 704 refineries and is distilled into gasoline, fuel oil and other petroleum products, it again begins to pollute, as anyone who has seen greasy clouds arising from a refinery can affirm. The oil industry, while taking some preliminary steps toward elimination of refinery pollution, admits that hydrocarbons, sulfur compounds, particulate matter and carbon monoxide still escape its purifying filters.

Oil pollutes most once it reaches urban areas. Each automobile or truck, each oil-fired furnace fouls the atmosphere. The automobile alone is estimated to cause 60% of America's total air pollution. And when oil products enter the air in tiny droplets they can combine with other pollutants to produce the smog now infamous from Los Angeles to Milan.

The long-term effects of oil pollution are only now beginning to be studied in depth. How much emphysema, the crippling and often fatal lung disease of city dwellers and heavy smokers, is due to oil pollution remains unknown but suspect. One leading scientist claims, meanwhile, that poisonous particles from oil spillage at sea are already entering the chain of marine life which ends on the world's dining tables.

Efforts to control U.S. oil pollution are getting under way—slowly—both in government and industry. The Water Quality Improvement Act passed in April increases penalties for offshore oil spills. U.S. oil companies have pledged to produce gasoline free of lead, one of its major pollutants, while auto makers have promised to design engines for lead-free gasoline.

Despite these measures Russell Train, who heads the President's Council on Environmental Quality, warns that oil disasters are increasing while the means to prevent them lag far behind. "Man can irreversibly degrade his environment," says Train, "to the point that he may have to engage in a major effort to survive as a species."

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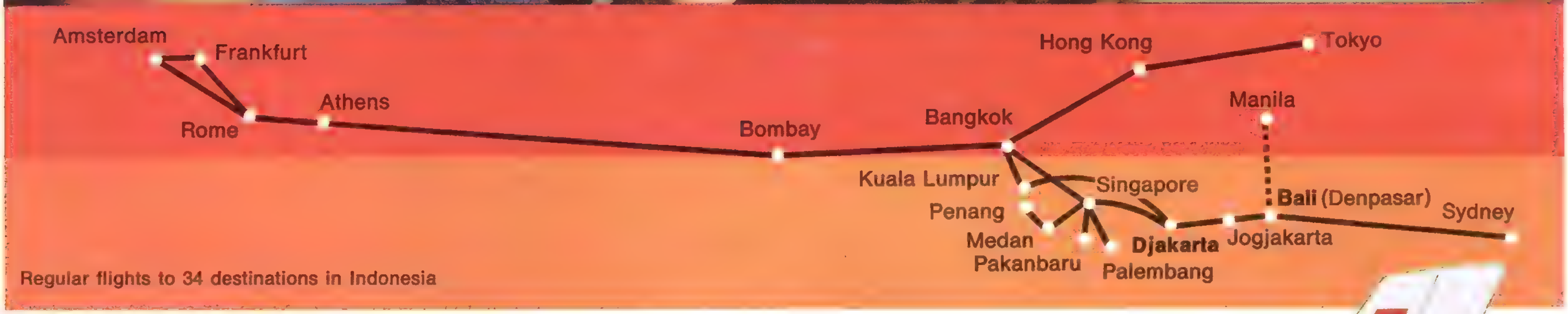

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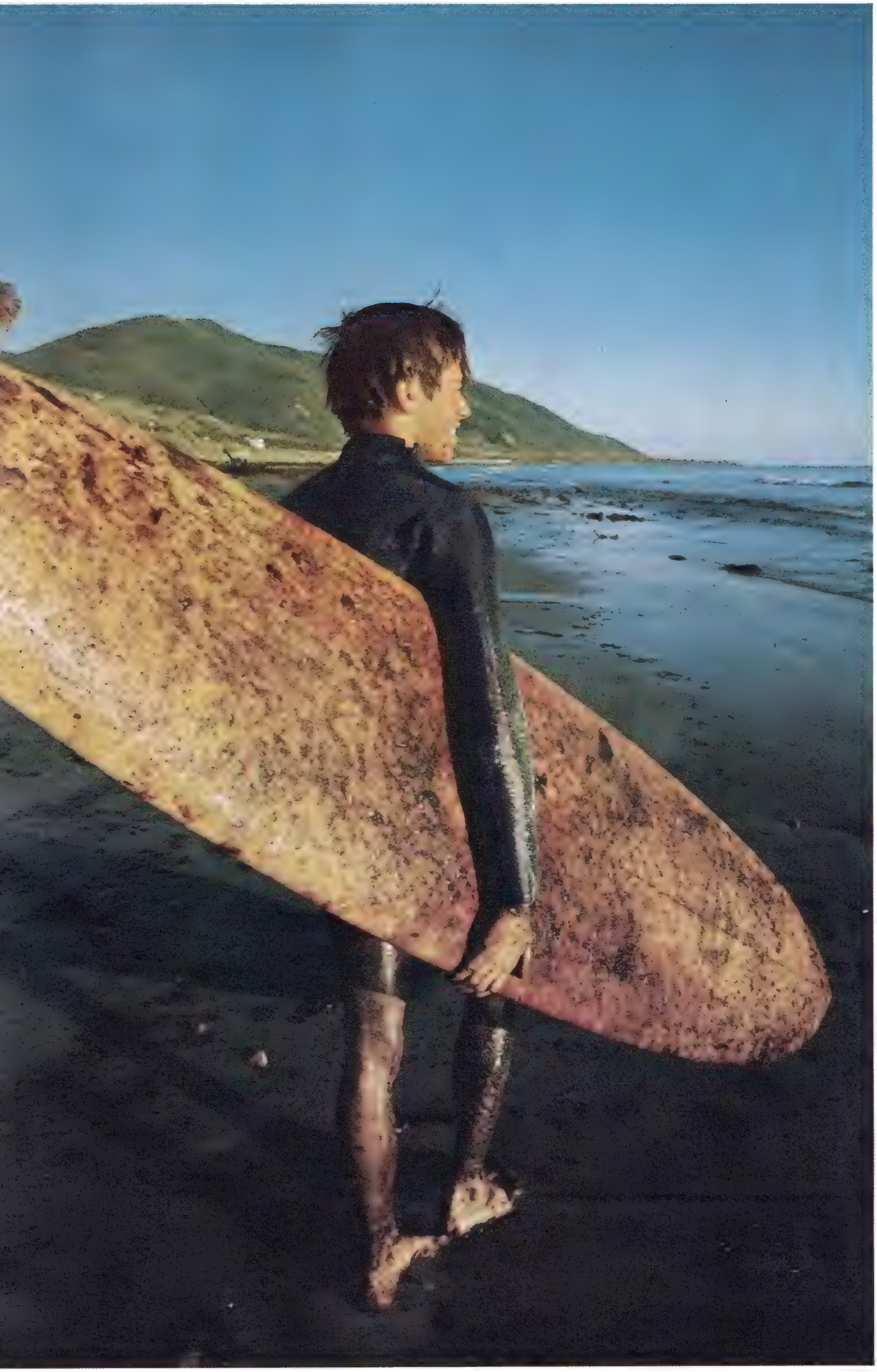

His body and board splattered by crude oil from an offshore rig leak, this California surfer shows how even the world of sport, once a guaranteed escape from environmental pollution, is no longer a safe haven.

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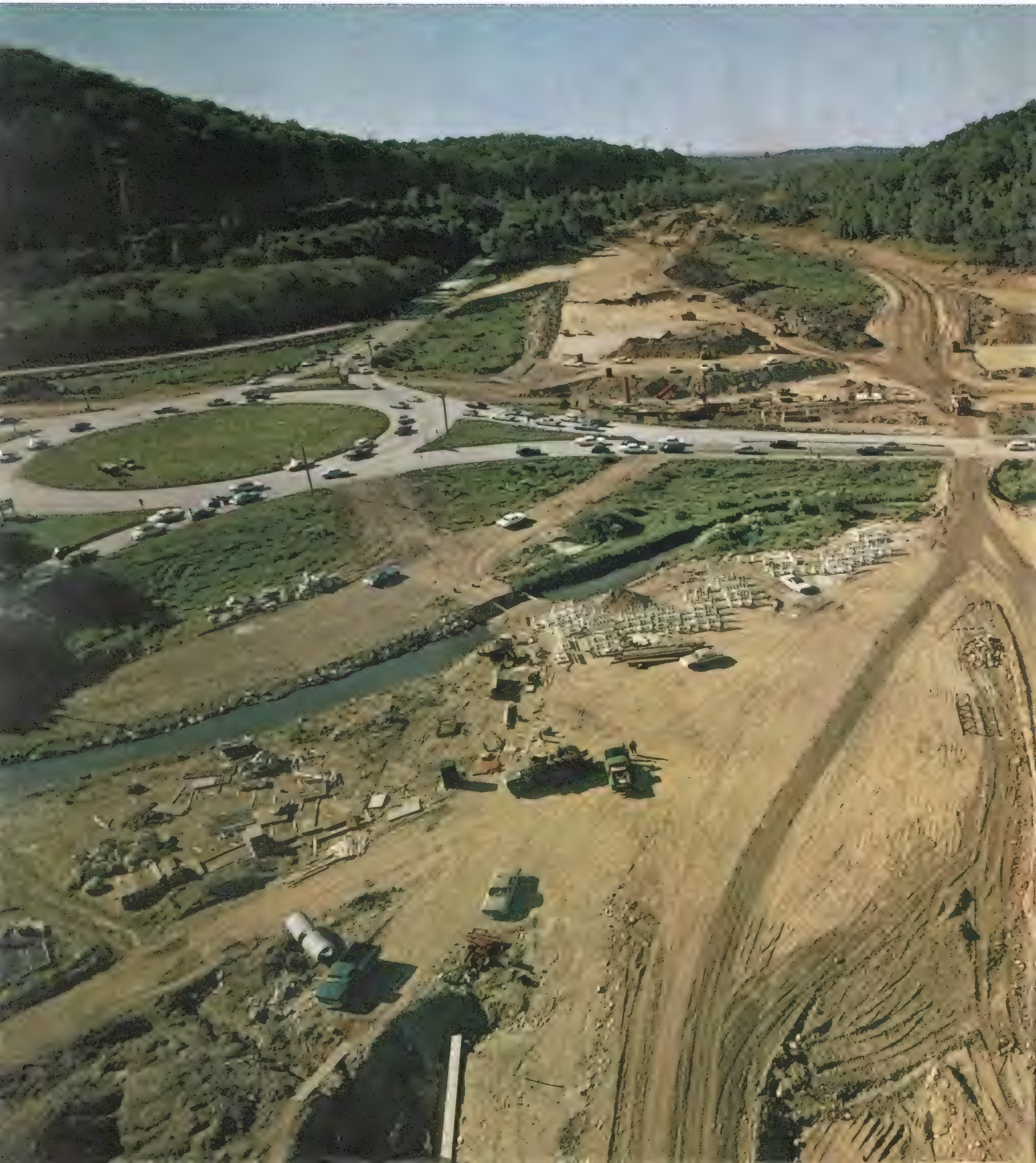
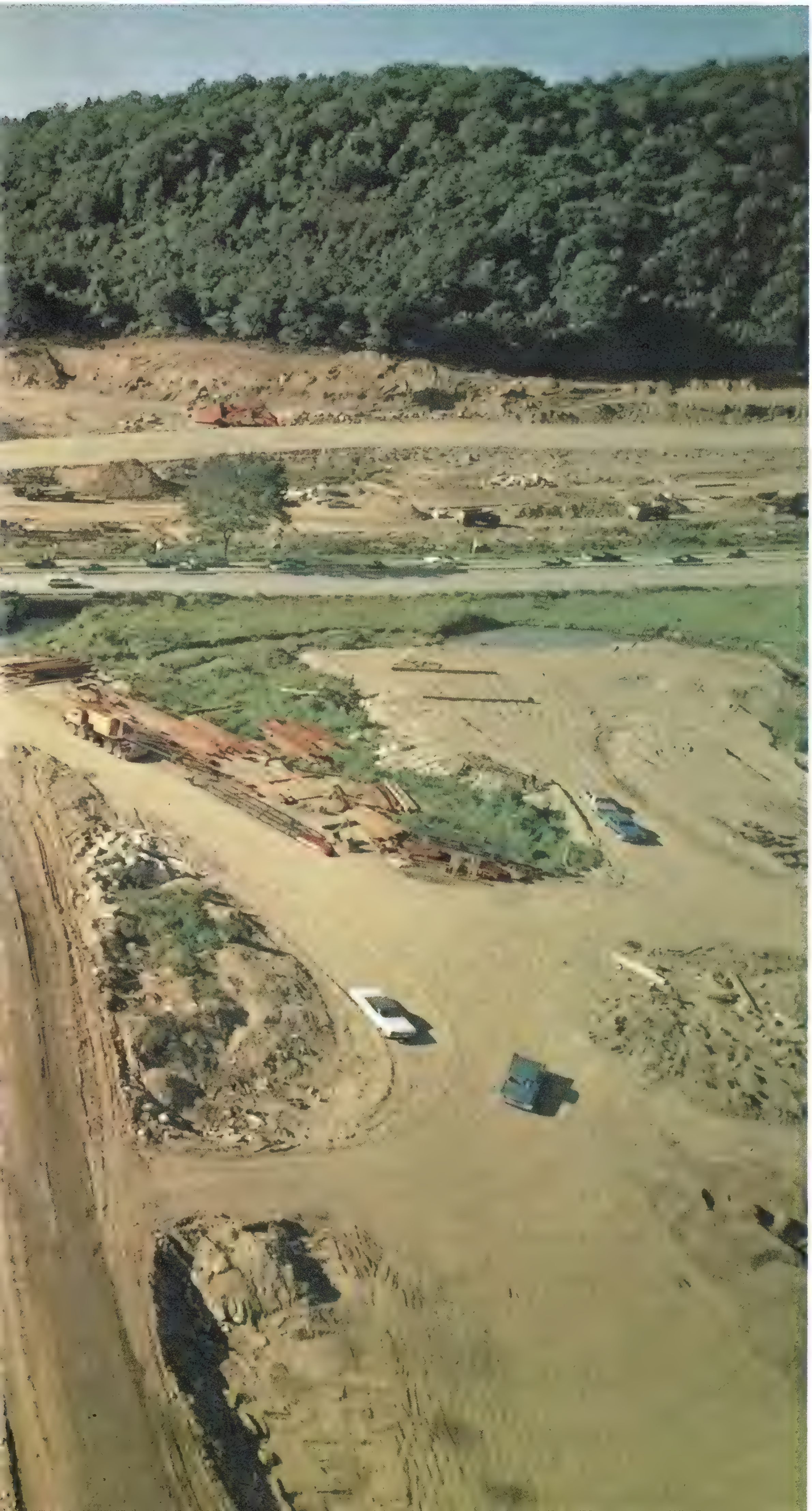


Pave that Grass!



And relax. Our kids won't know the difference

by PAUL O'NEIL

Fulminating segments of our citizenry have lately made it fashionable to protest the construction of new, multilane superhighways, even when they are not being asked—and this may startle you a bit—to surrender their own houses to concrete and the common good. Some of these dudes will hold a meeting if you want to pave a swamp in Idaho, and if you try to give them modern access to their own neighborhoods LOOK OUT. Nothing could be more unrealistic. Most of the malcontents are just as involved with cars as the rest of us, *need* new superhighways (known only a few years ago as "good roads") to run them on, and wouldn't go near a tree or a beach if they couldn't drive to it. There are a few hikers and deep breathers among them, true, and a few nuts who don't own automobiles, but these fine folks need new paving as much as we do; they, too, are subject to the car-truck-tire-highway economy in which we all exist today.

This should not suggest that parks, clean air, quiet trout streams, grass and secluded neighborhoods are not all right in their place—or that we should not enjoy them as much as we can while they last. We'll all be better off, however, when we face up to the fact that they are rapidly being outmoded, and when we get it through our heads that the rights, needs and importance of automobiles have superseded the rights, needs and importance of humans in many areas of our culture. We'll avoid a great deal of useless emotional conflict if we simply assume that our children will adjust nicely to the noise, glare, exhaust-laden air and increasingly sterile landscapes of the future. They'll have to, actually, if the country is to grow and become richer. And paving things over, once they are resigned to the results, may not work as many hardships on them as we think.

Take the photograph, shown here, of an incipient highway interchange which is being constructed in New York's shady Westchester County to replace an outmoded, even bucolic

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To speed traffic out of New York City and its suburbs, the old Hawthorne Circle rotary interchange (upper left) is being replaced by a supercomplex of concrete built over picturesque countryside.

A fellow can get himself killed

CONTINUED

old traffic routing device known as Hawthorne Circle. The Circle, built in 1931, demonstrates the folly of attempting to adapt paving to the landscape instead of the other way around. So do the roads it serves, particularly the Taconic Parkway, which was constructed to further a dangerously naive and sentimental concept—that city people might want to drive into the country on Sunday and enjoy the trees. Trees! The Taconic not only winds like the Mille Miglia, but runs through a regular arboretum—its flowering species bloom so wildly in the spring (one shudders at the money which was squandered on them rather than on earth-moving) and it is banked with such masses of golden leaves in the fall that a man can't keep his eye on the rear-vision mirror. Since tens of thousands of new cars now flood around the Taconic's bends on weekends, and jam, screeching, into incessant tie-ups, a fellow can kill himself and his whole family in the time it takes to admire a pink dogwood.

But all this is going to be fixed—the Taconic modernized, a big new superhighway busted through the neglected, if pleasant, countryside to the south of it, and, of course, the great new interchange erected to replace the rustic old circle. The photograph does not really do the project justice. It will eventually cover 120 acres, the unsightly piles of dirt will be replaced by vast, curving vistas of concrete, and it will sort out speeding cars on three levels—a "marvel of construction," as the engineers rightly describe it, which will cost little more than $25 million. Today's incessant complainers could do well to strive for a sense of proportion about such complex highway improvements. The Hawthorne Interchange will still be part of a system which will enable New Yorkers to get out of the city, but motorists of the future will be able to blast through it without distraction—just as they will be able to drive through the countryside without having to look at it. Let us not forget "highway safety"—which now limits automobile fatalities to a mere 53,000 a year. Let us not fail to honor the bold and inventive men who have given us whole days and nights at 70 miles an hour.

American highway engineers have long since accomplished the world's greatest feat of construction: there are 3,600,000 square miles of land in the U.S. and they have built 3,600,000 miles of road across it—an accomplishment which makes the men who raised the pyramids of Egypt and the Great Wall of China seem like dilettantes. They have, nevertheless, hardly begun—have only, in fact, paved an area as big as the state of West Virginia. But these beginnings have been productive. They have yielded the enormous machines and complex techniques which now allow engineers to dominate the land instead of remaining subservient to it; to whisk easily through vast strata of rock, to leap chasms, to rearrange rivers, to level hills, and to do it all fast, fast, fast. Some of the results are breathtaking. The machines ate through the basalt of the Hudson River Palisades like butter for Route 80, although it had resisted glaciation and weathering for 100 million years; they shortened 1,200 miles of trout streams in North Dakota's Black Hills to a handy 160 miles. The engineers have been thoughtful in the use of this power, too—they have tried their best to put their roads not only through unused wilderness areas (thus "opening them up" to motels and motorists) but through city parks—thereby saving the taxpayer's money and displacing hardly more than 100,000 people a year.

In his Washington office, Secretary of Transportation John Volpe defends road builders. "Those who object should be objective," he argues. "Perhaps environment and other historic values are sometimes not given enough attention, but that's the exception."

Are they applauded? Indeed they are not. The mayor of New York has recently been forced to abandon plans for two expressways in Manhattan. Citizens of Memphis are bawling like sheep at shearing time about a scheme to run six-lane Interstate 40 through the city's Overton Park—although the plan may yet succeed, since farseeing local big shots have bought land along the right-of-way. Cambridge, Mass. is positively fissioning about the expressway which State Public Works Commissioner Edward J. Ribbs wants to push through its college town. "If you tripped and fell down," one of the recalcitrants cried recently, "Ribbs would pave you." And John Volpe (President Nixon's Secretary of Transportation)? "He'd pave Ribbs!" The engineers do not, however, allow such selfish local incidents to deter them in their vision of a greater America—and there are still politicians sturdy enough to ignore public censure for The Cause.

None has been more steadfast than Kentucky's Democratic Congressman William H. Natcher, a man who has almost complete control—by virtue of serving as chairman of the House subcommittee on appropriations for the city—of all funds expended in Washington, D.C. Natcher has been a key figure in the capital's bitter struggle to solve its hideous traffic problems caused, in great part, because tens of thousands of government employes must drive across the Potomac from Virginia and not only jam the river's bridges morning and night, but jam the city in the daytime. A great mass of Washingtonians has long maintained that high-speed suburban subway service beneath the Potomac—which would substitute trains for vast fleets of private automobiles—offers the only logical way of easing traffic jams. But the congressman sided with the good-roads folks—and Washington's merchants—when they blandly proposed yet another series of highways be led across the river and into the city.

All hell broke loose on the instant. Residents of historic Georgetown screamed that part of that lovely enclave of trees and antebellum houses would be obliterated. Admirers of the Potomac's placid charms protested that one of the proposed additions—a new Three Sisters Bridge—would violate one of its last inviolate stretches and city people cried that it would be a "gun pointed straight at the capital's Glover-Archbold Park." Black residents anticipated dispossession by paving-to-come. The city council rose against the scheme to a man and senators bayed against it. Congressman Natcher stood firm. He had no objections to underground trains at all, he said, but added that the city couldn't have them without taking the new highway system and the Three Sisters project too. "No bridge, no subway." He had his way, too. He tied the release of $2.5 thousand million for the 98-mile underground project to a construction start on the highways and the river crossing. Then he j-u-u-s-t

while just admiring a pink dogwood

sat back and waited, despite vehement cries of "blackmail" and fist fights at public meetings; the council finally broke down and voted—with two members openly weeping—to accept the package deal.

The congressman, of course, possessed a degree of leverage and of insulation from the public which is denied local politicians, and we must doubtless expect cities to keep demanding our tax dollars for rapid-transit subway systems like the $1 thousand million 75-mile project which will link San Francisco to suburbs in two counties on the east side of its bay in 1971. But none of this should suggest that we will not go on paving, paving, paving; in the Boston-New York-Philadelphia-Washington megalopolis of the Northeast, in car-happy California, in the purlieus of all other great cities and on the connective routes between them. We will do so, in part, because 1969's herd of 104,702,000 motor vehicles will grow by 20 million even as early as 1975, and because the new cars will demand fresh living space more successfully than their masters. Their masters, in fact—unless history reverses itself—will surrender it to them, demand it for them, in return for the mobility and ego fulfillment they offer at the touch of a button.

The great earth movers and paving machines will be urged across the country by more pragmatic considerations as well. Almost 13 million people—one person in six in the U.S.—make their living from selling, manufacturing, driving or repairing gasoline-powered vehicles. One in four of our retail dollars is spent on them. The petroleum industry feeds them 75 thousand million gallons of fuel every year. The banks loan $30 thousand million to pay for them. Insurance companies extract $6 thousand million in premiums for insuring them. They use 20% of our steel, 51% of our lead, 60% of our rubber. Deny them right to roam at 70 mph in their increasing hordes, and the affluent society which we so criticize and so embrace will begin thumping like a 1911 Apperson Eight with two flat tires and a leaking radiator.

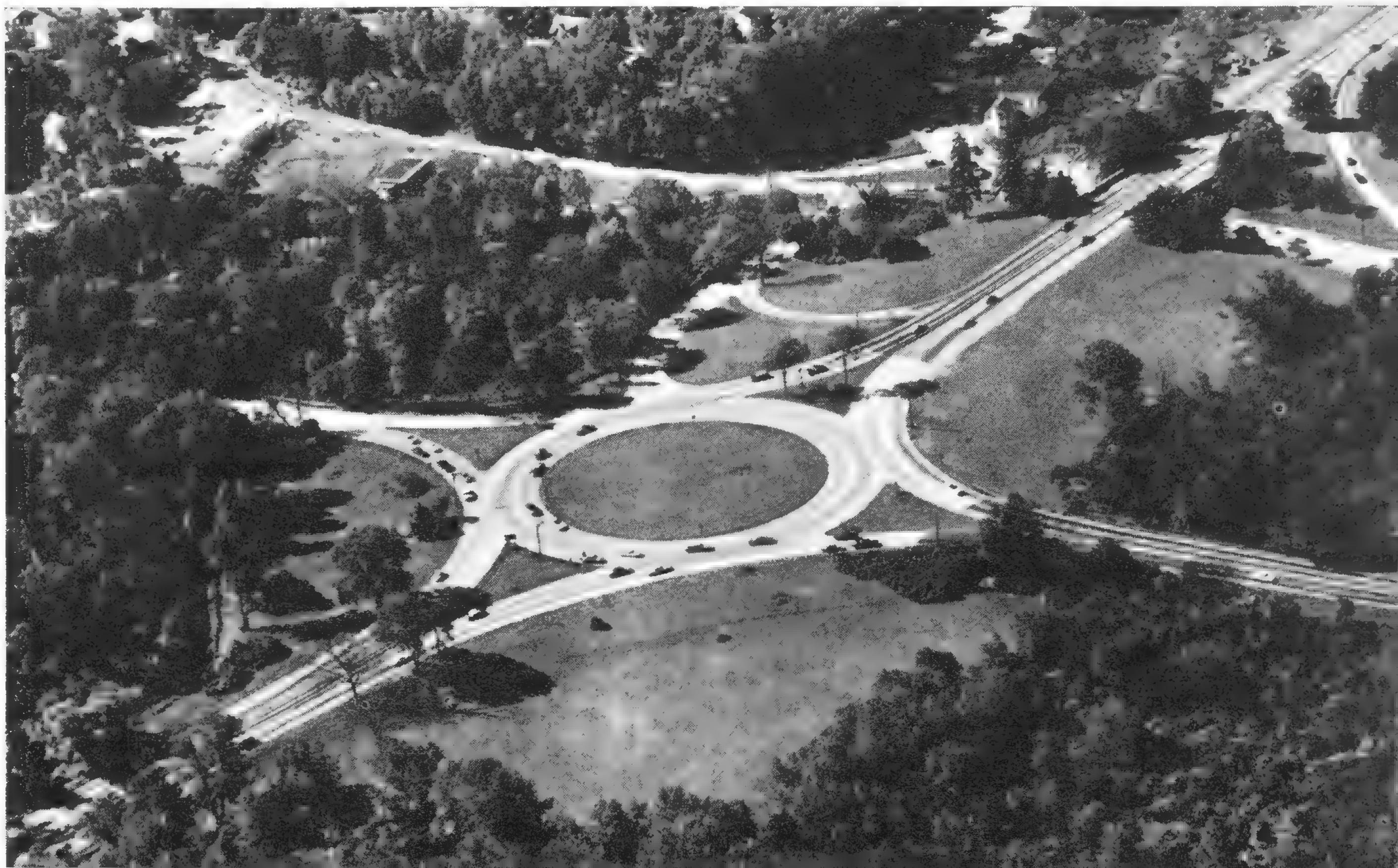
But never mind all that. We're going to have the cars AND the roads. *Big* roads to straighten out all those millions of miles of *little* roads we built back in the eras of the Model T and the Willys Knight. Forget all the propaganda about air pollution—it doesn't mean a thing. Not that we won't be subject to deafening waves of dissent as we press on with the task of making our great highway system even greater. You may even—since we all have our moments of selfishness—become part of the phenomenon yourself. Superhighways *do* cut towns in half, ruin the countryside and make night hideous for those who live near them, and all of us get a little sore when it happens to us. But a lot of us have already gotten sore—our new 41,000-mile Interstate highway system is currently gobbling up more right-of-way land than is contained in the state of Rhode Island—and all the frayed tempers, cries of despair, letters to legislators and public meetings have not inhibited the advance of the road crews.

They will not inhibit them in the future either. There's a reason: the Highway Trust Fund—a pork barrel of such magnitude that no congressman, senator, governor or state highway official can possibly ignore it. The Fund sucks tax money out of the sale of spare parts and tires, and takes four cents from the price of every gallon of gasoline sold in the U.S. It puts all this treasure back into superhighways. Since every mile of road increases tire and gas consumption the Fund gets bigger—and spawns yet more roads—every year. It will go on doing so: a congressman risks political suicide if he does not bring home ready-for-the-asking federal funds, and a governor would be thought mad if he rejected such gravy.

Richard Nixon is currently talking of a reduction in federal funds for road building. But consider what happened to Lyndon Johnson—that King Kong of political arm twisters—when he froze $1.1 thousand million of the Fund's $4.4 thousand million in 1966. His motives were uncommonly patriotic and pure; he just wanted to head off inflation. But he turned all the money back in six months to avoid being filleted and fried by all the good old boys who didn't want their country deprived of a mile of paving it deserved. He *talked* about trying again the next year when Congress demanded spending cuts of him, but the governors raised such hell ("Complete farce," cried Pennsylvania's Raymond P. Shafer; "Dishonest," said California's Ronald Reagan) that he hastily lopped foreign aid, poverty funds and other such unimportant areas of fiscal endeavor instead. "Any cutback in the highway program," as Maryland's Congressman George H. Fallon intoned, "would [have amounted] to breaking faith with . . . motorists."

So there we are. We will not achieve our high-speed, 10-lane future without being forced to deal with one area of real difficulty (as opposed to those more philosophical difficulties like midnight truck exhausts, traffic jams, home flattening and [yawn] unbreathable air, which do little but stir up talk). There *will* be a beer can problem. Americans not only like to switch lanes at 70 mph but like to go places where they can 1) drink beer out of cans and 2) throw the empties into bushes or streams. Such areas will obviously diminish as paving goes on, and—as Americans are deprived of genuine objectives for motor trips—driving mileage, prosperity and tax yield could very well diminish too. A grand, new, dramatic target for beer cans will become a national necessity sooner than we think—one preferably at some distance from centers of population to keep our tire factories and gas pumps in action. Such a target is available. If you agree that the Grand Canyon is the perfect choice (and isn't it time we put our national parks to some real use?), write your congressman today! ■

Hawthorne Circle before reconstruction. The simple rotary design could not handle today's heavy traffic safely.



‘The length and the breadth and the sweep of the

In the coastal Georgia wetlands that beckoned a poet, the developers are on the move

Photographed by JOHN LOENGARD

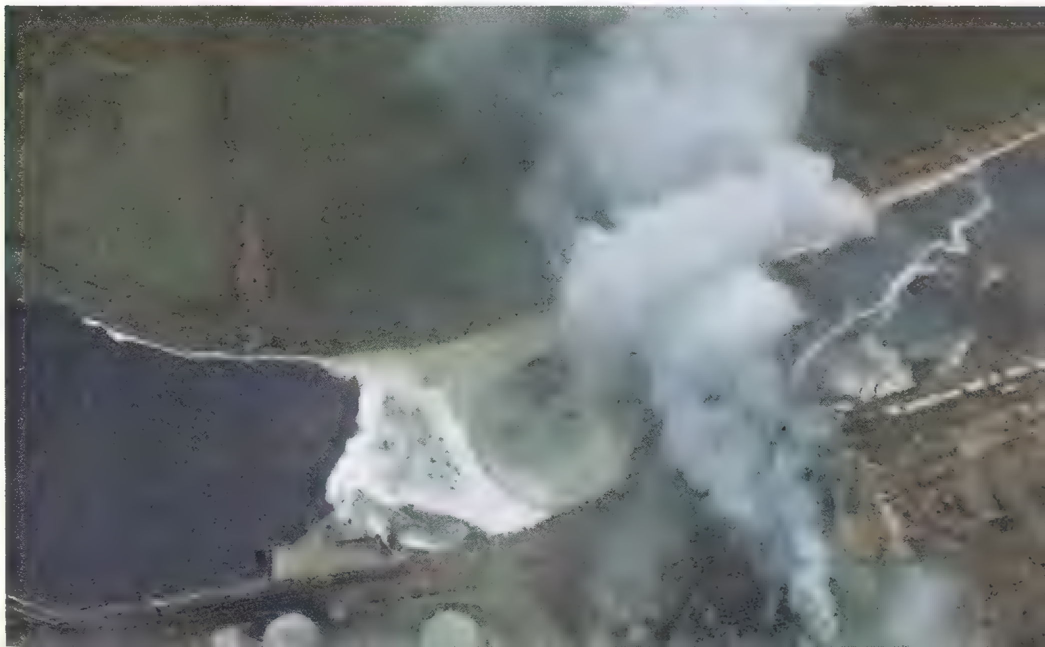
There is an illusion of vast emptiness here, on the marshes of Glynn along the coast of Georgia. But no sooner has that void engulfed the eye and heart than the salt marsh comes vividly alive: the rustle and flutter and gurgle of life going on right now —birds and fish, bugs, rabbits, spiders, scuttling fiddler crabs. All thrive in this lacework of canals and pools, where the northeast winds whip down through the marsh grass, and stir among stark reminders of the hourly struggle for survival in the marsh —gnawed old stumps jutting up through the horizon line, bleached skeletons of turtles and horseshoe crabs, a gull’s skull. Always there is the distant surf, bringing in the ocean’s flotsam, living and dead, and at the same time cleansing the island beach, caressing it, smashing it, shouting, murmuring. Here the ground

On the southern coast of Georgia the estuarine marshes of Glynn stretch, green and gold-flecked, to the stump-studded horizon. Below, a pulp mill at St. Mary's emits chemical pollution threatening nearby salt marshes.

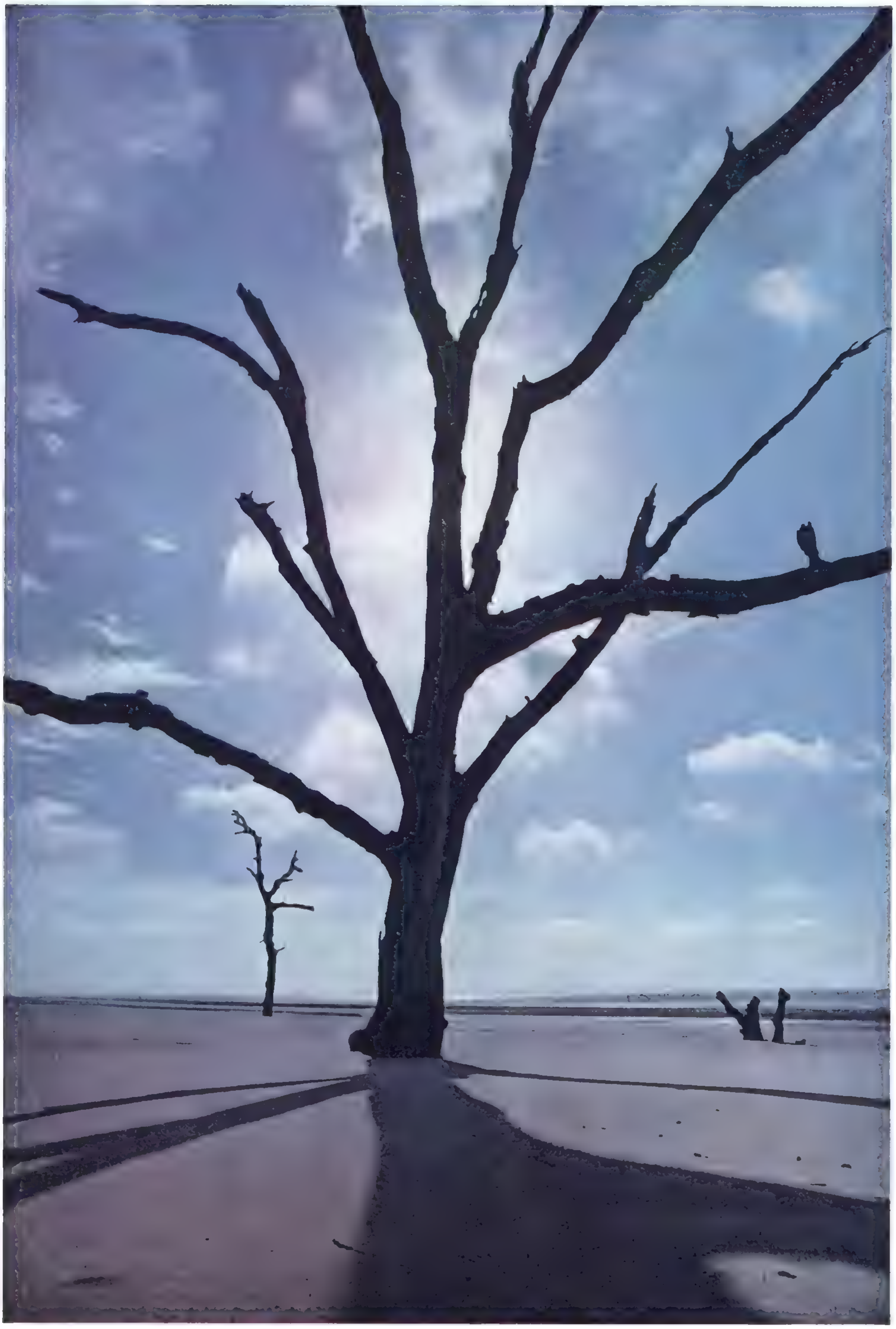
marshes of Glynn'

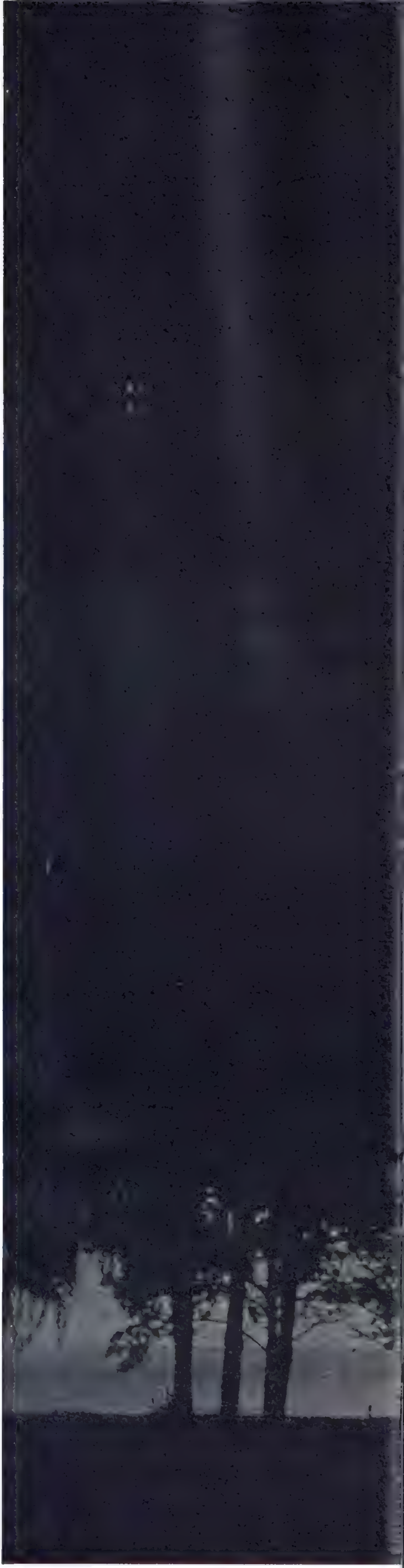
itself seems to float, and beyond the horizon lies only ocean and then, hundreds of horizons away, Africa. Man's predecessors must have emerged from marshes like these; some primeval memory makes him return. More than a century ago Poet Sidney Lanier wrote of "the length and the breadth and the sweep of the marshes of Glynn," where "My heart is at ease from men, and the wearisome sound of the stroke of the scythe of time."

But, like the appearance of emptiness, that sense of enduring sanctuary deceives. Resort developers long have coveted the land, industry its timber and minerals. Now they have engaged newly awakened conservationists in a battle for the future of Georgia's offshore islands and the timeless marshes of Glynn.



‘Glooms of the live oaks beautiful—braided and woven’





On the beach of Georgia’s Ossabaw Island (*above*), where an Oklahoma industry wants to strip-mine offshore for phosphate, a long-dead oak tree casts its skeletal shadow across the sand. At right, Ossabaw’s live oaks cluster in near-tropical profusion, almost blotting the sun from view.

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'It is no longer a luxury to save our estuaries—it is a scientific necessity'

Dr. Eugene P. Odum, an ecologist and conservationist.

Scientists have only recently learned that marshes are critical links in the chain of ecology. Four out of every five creatures on earth dwell in the sea, and a good many of these oceanic creatures including sea trout, striped bass and shrimp are born or grow up in estuarine areas like Glynn. These salty pastures of cord grass and sea grasses produce 20 times as much food as the open sea, seven times more food than an alfalfa field, twice as much as a cornfield. A dollar-per-acre value on marsh is difficult to establish, and the lack of one has put conservationists at a decided disadvantage in their efforts to persuade legislators to protect the wetlands. But one study of the estuarine lands along the Chesapeake Bay in Maryland, found that each acre of marsh yielded about $200 in expenditures for fishing tackle, hunting licenses and actual food production every year and thus was worth as a capital resource, without any improvements whatsoever, around $4,000.

Resort developers look at the land as raw material for their speculative endeavors, and thus see it as worth potentially far, far more. Land at Hilton Head Island, S.C. was bought by developer Charles F. Fraser in 1950 for just $50 an acre. Today half-acre lots in this sumptuously equipped island hideaway are selling for about $35,000. Fraser privately refers to conservationists as "druids" and jokingly proposes erecting little platforms for them out on the salty flats where they could sit in blissful solitude. Recently, however, one of his entrepreneurial ventures turned as bitter as the brackish water from the salt flats he jokes about. His purchase of 3,000 acres of land on Georgia's Cumberland Island ran into a hornet's nest of opposition from a few wealthy families who have built homes there and zealously guard their privacy. Now they are so fighting mad about Fraser's plans to commercialize their little retreat that they have had a bill introduced in Congress to designate their island beach a national seashore.

Eighty miles to the north, near Savannah, an Oklahoma firm, Kerr-McGee Corp., has discovered that the marshes overlie a rich lode of phosphate. In 1967 it purchased 12,000 acres on several islands and in 1968 asked the state for leases to strip-mine underwater state lands. A committee of academicians appointed to study the request found that Kerr-McGee proposed removing 36 million cubic yards of marsh each year, partially destroying the fish nurseries but yielding the company three million tons of phosphates and the state some $2 million annually. There is a major danger the report warned, that careless dredging operations might puncture the "aquifer," a subterranean stratum of fresh water that lies beneath the phosphate deposits, and contaminate the state's water supply.

The committee concluded that Georgia, like many coastal states, had no clear control policy governing wetlands development, noted there now is time "before great damage is done" to establish one, and urged the creation of a new state agency to do just that. Georgia Governor Lester Maddox read the report and ordered rejection of Kerr-McGee's proposal.

But conservationists were keenly aware that while the mining and the resort development had been stopped, it was only a temporary halt—the marshes would continue to beckon exploitation. The example of other states is clear: the New Jersey coast has lost 35,000 acres to draining and dredging in the last 16 years. Maryland loses 1,000 acres a year, and in North Carolina an acre of estuarine land vanishes every day. In New York City the Bronx had 1,860 acres of marsh 15 years ago; today 50 remain. The full toll of this loss is impossible to estimate, but one statistic indicates the immensity of the eventual cost: in the decade between 1955 and 1965, the haul of estuarine-dependent fish caught off the East and Gulf Coasts dropped more than 100 million pounds.

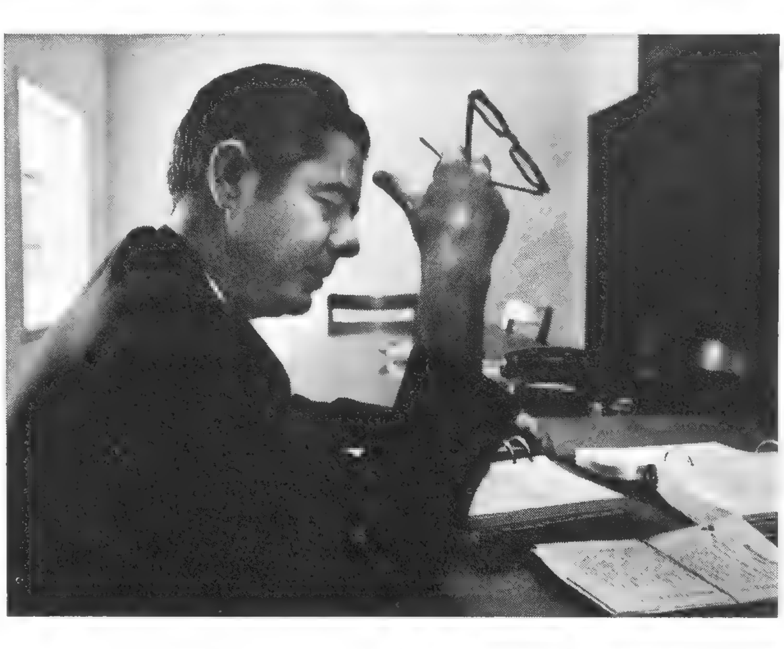
"It is no longer a luxury item to save our estuaries," declares Dr. Eugene P. Odum, a member of the Advisory Committee on Mineral Leasing. "It is a scientific necessity." Odum, professor of zoology and director of the University of Georgia's Institute of Ecology, has been a leader in the Georgia conservationists' battle against haphazard wetlands mining and development. "Right now," he says, "we need to hold the line so that our great natural resource is not frittered away here and there for the quick gain. We need to hold the line until we have time to come up with an overall plan."

Odum sees Georgians faced not so much with a crisis as with a unique opportunity. "We have a chain of golden islands and marshes and estuaries that are relatively unspoiled. They are still here for us to use, and if we plan wisely, now, we can have sound development for industry, for recreation, for housing, and *still* keep some part of the natural nurseries of our sea that we must have if the productivity of the ocean is to be and remain a reality."

Such talk, however, runs directly afoul of one of the most cherished of Southern notions—a man's land is *his* land and he can do with it whatever he pleases. Georgia Representative Robert Harrison Jr. from St. Marys, on the coast, has introduced a welter of legislation that would enable landowners—including Fraser—to proceed with their individual plans for their own land. "I feel," says Harrison, "the attorney general should tell us how much of the salt marsh acreage is state-owned. The rest is privately owned and belongs to private people. They should be allowed to do with their land what they want." Harrison admits the marsh—some of it—should be preserved. "We can conserve and preserve," he says, "without telling people just what they can and can't do, which isn't constitutional. I say, 'Let's live and let live a bit.' We've got to have some development. People are going to have all this recreation—but they've got to have jobs first." One recent Harrison bill tried to create a "state recreation authority" empowered to condemn land on Cumberland Island no matter what the residents thought, or sell it to the highest bidder—an ironic twist for a professed defender of the sanctity of private property. Although this bill was rejected during the 1970 session of the Georgia legislature, conservationists know the Harrison bill, like the fight over the Kerr-McGee mining proposal, was just an opening skirmish in a long, long battle.

'We can conserve and preserve without telling people what they can and can't do'

Robert W. Harrison, defender of private property rights



THE ESSO STATION-ON-WHEELS

At Rødbyhavn, Denmark another special service for the New Europeans.

If you ever have to wait at Rødbyhavn, Denmark, for the ferry to Puttgarden, Germany, chances are you'll meet Mr. Jacobson. He operates the Esso station-on-wheels, going along the lines of cars, topping up tanks, checking oil, tyres and batteries.

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At the 'Happy Motoring' sign everything for the New Europeans

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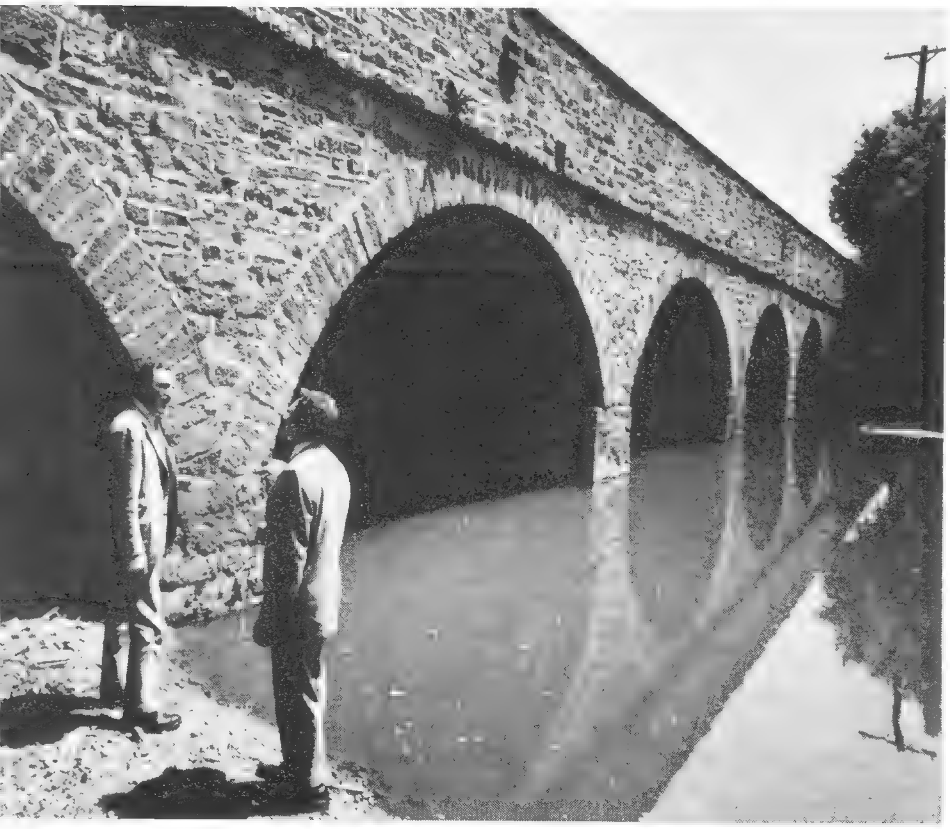
Asked to evaluate the effects of building a dam in the Skippack Valley northwest of Philadelphia, McHarg talks with psychiatrist Dr. Joseph Peters, above, who heads Citizens to Save the Skippack Valley and whose own 1702 house (background) would be one of 12 historic buildings destroyed by the dam. Below, the Skippack Bridge, is another imperiled structure. McHarg's survey recommended the dam not be built.



A salty Scot from Philadelphia says that

Ian McHarg

by ruining the land man dooms himself

vs. Us Anthropocentric Clods

"Man is a blind, witless, low-brow, anthropocentric clod who inflicts lesions upon the earth." Such is the dour view of ecological planner Ian McHarg, who, besides being head of the Department of Landscape Architecture and Regional Planning at the University of Pennsylvania, is considered by many to be an eloquent and important successor to Rachel Carson. His prophecy, delivered in a Scottish burr, is that if we continue any longer raping the land, befouling the waters and polluting the air, mankind itself will surely perish. His book *Design with Nature*, published by the Natural History Press, blames our "scabrous towns" and "mined landscape" on man's arrogant assumption that he can build anything anywhere and get away with it. The only nonsuicidal alternative, he says, is to plan *with* nature instead of against it. Face to face, McHarg is just as spiky. A Philadelphia matron recently complained to him about air pollution. "Do you know the president of Pennsylvania Electric?" he asked her. "Yes," she replied. "Well," he said, "the next time you see him don't shake hands. Leap upon him and bite his jugular vein!"

McHarg pulls a choking vine off a young oak. "Weeds," he says, "are plants of disturbance" and diminish when land reverts to its natural form.

On his farm, right, 80-year-old H. K. Lesher talks with McHarg about the dam which, if built, would flood him out along with 400 other landowners.

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In the classroom McHarg listens to students of landscape architecture present their projects. "The cause I ask them to espouse will bring them neither power nor money," he says, "but they are devoted to it." Below, with his wife Pauline, he sits on their terrace and makes a joke about his beard. Their property adjoins a large Philadelphia park which guarantees that their environment will stay the same for a considerable time.

Man is the agent of 'evolutionary regression'

Professor McHarg's observations are drawn from his book and from a widely seen television broadcast.

▶ And when there are 100 million more of us by the year 2000, will our cities be sicker still, our suburbs just as sick, our landscape further befouled? That's likely to be so, Mate. And the reason is simple. We are a man-centered society. We have never learned that we're a part of nature.

▶ Consider the moon. . . . The costs of "terra-farming" this naked, hostile planet to that benign condition which can support life as abundantly as does the earth are considered of such magnitude as to be inconceivable. Colonies on the moon will thus have to be small envelopes enclosing some of the essential commonplaces of earth transported as priceless and indispensable commodities. The man on the moon will know the value of these things.

▶ It is not that man has produced evidence for his exclusive divinity, but only that he has developed those powers that permit the fulfillment of his aggressive destructive dreams. He now can extirpate great realms of life: he is the single agent of evolutionary regression.

▶ There are other aspirants who vie to deface shrines and desecrate sacred cows, but surely it is the highway commissioner and engineer who most passionately embrace insensitivity and Philistinism as a way of life and profession.

▶ I think you'd probably select the Jersey shore as the supreme example of development based upon ignorance, greed and malice.

▶ Let us abandon the self-mutilation which has been our way and give expression to the potential harmony of man-nature. The world is abundant, we require only a deference born of understanding to fulfill man's promise. Man is that uniquely conscious creature who can perceive and express. He must become the steward of the biosphere.

Yes

The World is saying Yes
to bold gold
BENSON & HEDGES

Have you said Yes yet?

'We have met the enemy, and he is us'

THE SUBVERSIVE SCIENCE
edited by PAUL SHEPARD
and DANIEL McKINLEY
(Houghton Mifflin) $8.95

THE ENVIRONMENTAL HANDBOOK
edited by GARRETT DE BELL
(Ballantine Books) 95¢

ECOTACTICS: THE SIERRA CLUB HANDBOOK FOR ENVIRONMENT ACTIVISTS
(Pocket Books) 95¢

Ecology as mystical understanding is very old. Primitive people all have it—it is part of their reverence for the earth. Even in industrial times every good husbandman—a term that excludes soil miners and chemical farmers—accepts and fosters the interrelatedness of life forms.

Ecology as a science is relatively recent. One of its earliest statements came in George Perkins Marsh's *Man and Nature* in 1864. It has emerged as a field of study only in the last 30 years, growing with the deepening of the environmental crisis, and perhaps profiting in some degree from the development of systems theory.

Ecology as a mass movement is hardly two years old. As part of the Youth Revolution it has become militant. Some radicals have wanted it to adopt the confrontation tactics characteristic of the civil rights and peace crusades, and some Establishment figures, including Governor Reagan of California, feared that in its first great trial synthesis on Earth Day, April 22, it might do just that.

Mr. Reagan had reason, for ecology is more revolutionary in its implications than either civil rights or peace. To realize every aspiration of black and Third World people would be only to redistribute what we have. To get out of Indochina and curb the Pentagon would do no more than return our industrial society to more defensible uses. But ecology, made a guiding principle in our affairs, would turn our society upside down, question its aims, assumptions and methods, alter its mentality, overthrow its gods. And possibly save it from itself.

Three current books, two in paperback, make clear this revolutionary potential. Even *The Subversive Science*, a collection of scholarly essays edited by Paul Shepard and Daniel McKinley, wears its colors in its title. *The Environmental Handbook* and *Ecotactics*, the first produced by Friends of the Earth and the second by the Sierra Club, with an introduction by Ralph Nader, are both battle plans for Earth Day, tactical manuals for environmental activities.

The Subversive Science is subversive not in its approach but in its substance. In essays by archeologists, anthropologists, biologists, landscape architects, philosophers, historians and demographers, it relates man to his origins, his technical advancement, his earth, his fellow creatures. Its subtitle is "Essays toward an Ecology of Man," but its message is that there is no specifically human ecology. There is only one ecology, and man is part of it—properly as member, too often as destroyer, ultimately as victim.

These essays do not denounce the villains who have done us in. Implicitly they acknowledge Pogo's wisdom: "We have met the enemy, and he is us!" But the sobriety of the writing, the distinction of many of the contributors, the fact that the book is no product of recent panic, but the gleaning of 40 years of intelligent concern for the environment, make it, as its general editor Starker Leopold says, "frightening." This civilization has been set for centuries on a suicide course.

The Subversive Science asks profound questions. The two tactical manuals specialize in answers, suggestions for organization and action. They begin where the scientific ecologists leave off. Because both handbooks are written for and, in large part, by the young—*Ecotactics* has only two contributors over 40—they come to old problems with new urgency and new hope. These manuals are buoyant. Their writers dem-

For those of you interested in figures:
In 41 months since the inception of USIF, Real Estate on January 6, 1967
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Beautiful. Just beautiful.

onstrate a touching confidence that now they are in it, something will get done. And if some tend to misrepresent the crisis as a we-they conflict—that is, if they think like young revolutionaries—it is also true that if they recognized it as a we-us conflict they would be more revolutionary still. "You can't be serious about the environment without being a revolutionary," says California Poet Gary Snyder. "You have to be willing to restructure society."

Willingness is not, of course, ability. For so profound a cultural change as ecology suggests, no merely political overturn would serve. That seems to be widely acknowledged. New Left attempts to take over several Earth Day campus teach-ins generated more irritation than support.

As a matter of fact, ecology has more true believers among hippies than it has among the New Left. The attractions of the tribal and primitive, of Zen, of mystical noncompetitive, nonproductive attitudes, are all related to the yearning for a healthy earth community. The Buddha seems a sounder ecologist than Sir Francis Bacon or Henry Ford, St. Francis appeals more than Aristotle or Archimedes.

Both these handbooks are hasty gatherings, and run the gamut from the intensely practical to the visionary and even the absurd. There are pledges to nonmotherhood, plugs for birth control clinics and relaxed abortion laws, accounts of how a dumping ground was made into a park, tips on how to pressure city hall or Congress, suggestions on how to educate, without alienating, "them." There are programs for recycling aluminum cans and waste paper, suggestions for picketing markets that sell nonbiodegradable detergents, plans for accosting all fur-clad ladies in the streets with the information that five leopards were slaughtered for their backs, examinations of the legal loopholes that let industrialists go on polluting, schemes for replacing the automobile with the bicycle. The tenor of these essays and proposals is profoundly antitechnological, and there is a good deal of fairly naive Brook-Farmism, as for instance in the suggestion for linked rural-urban communes with a "two-way flow of experience, money, gentleness, love and homegrown vegetables."

Nevertheless, most of what these handbooks propose is hard practical agitation within the present political framework. Much of it is eminently sane. All of it is based upon the perception that industrial society, unreformed, will shortly make the world uninhabitable.

Where I live, near Stanford University, there is a perceptible effect from Earth Day and the student involvement in ecology. *Ecotactics* and, I presume, *The Environmental Handbook* continue to be bought and read; there will be a further effect of them in next November's elections. Since there is no instance in history of an advanced technology reversing itself, one has to assume that the new primitivism is not the answer, that the answer is the control and direction of our awesome power over nature, and the control of our own numbers. We are a weed species. That in itself is revolutionary, and the beginning of wisdom.

by Wallace Stegner

Mr. Stegner is a novelist, historian and former Sierra Club director.

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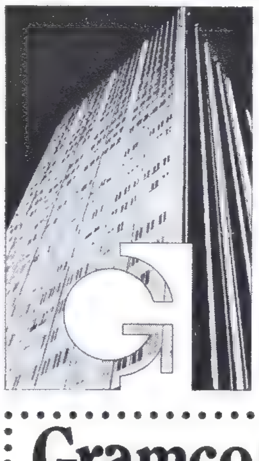

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Shot on Prudhoe Bay Alaska – minus 51° Centigrade

Our fragmented power has outrun our methods of deciding how to deal with technology

Slowly as a poisoned snail, public concern over the physical environment crept forward during the first half of this century. In the '50s anxiety began to quicken. In the '60s the environment became one of the major topics of American discussion. In the last few months it has been almost impossible to look at a newspaper or a TV set or to talk to a stranger on a plane without encountering some example of dismay over what we are doing to the world around us.

Yet snails, along with all the other species—notably including man—that live on or near this once fair land, continue to be poisoned or choked or pushed around or otherwise imperiled. If, as seems quite likely, public anxiety mounts to 10 times its present level, we will not necessarily succeed in correcting our present lethal course. Alarm about the environment, fully justified by the facts and long overdue, is a required precondition of reform. But alarm, by itself, puts out no fires.

It is not hard to imagine how disgust with our mishandling of the environment could become, as in some quarters it already has, just one more taunt against "the sick society," one more whip in the orgy of self-flagellation that has seduced so many professional observers of this pseudo-penitential time. Unless guilt over what we have been doing is accompanied by a stronger sense of what to do instead, U.S. morale may sink to the point where we will be unable to cope properly with the environment—or anything else.

Some of the grave challenges that arise from American abuse of the natural resources of air, water and land and from our failure to honor the terms of partnership in which men coexist with other forms of life have already been conquered, however (*see pp. 46–58*), and many more are being firmly met. Our primary intent is not breast-beating or doom-saying. Many of our readers are already aware that progress has, somehow, been ambushed by its misbegotten children, the unintended by-blows of the modern lust to know and to do.

American business, since it organizes and channels a high proportion of the total action of this society, has been and still is deeply implicated in depredations against the environment. Any way out of the present mess will have to rely heavily upon business for resources, for innovation, and for leadership. The political and social ground rules within which business is conducted will have to be drastically amended. Important corrections will have to be made in the terms of economic calculations that now skew business decisions in destructive directions. In short, business, along with all other major functions of society, will have to change if Americans are to achieve a better environment.

Other articles in this issue deal with specific aspects of environmental problems. This article, however, essays to view the challenge in the round, to probe for the root common cause of such disparate symptoms as traffic jams and vanishing lakes, to establish a perspective between material blight and material progress, to sketch the character of new moral, intellectual, political, legal, social, and economic patterns that must soon be evolved. And beyond this tall order lies the inescapable question of how an effective social program of cherishing the environment might fit with the future of the long march toward individual freedom, and whatever else we mean when we speak of "the quality of life."

Winston Churchill in October, 1943, made in the House of Commons a gemlike speech on an unlikely topic for a time of total war: the relation between architectural design and human behavior. The old House had been blasted by a Ger-

How to think

by MAX WAYS

Adapted from Fortune

about the environment

Iceberg-like masses of soapsuds from sewage overflow glide down the Cuyahoga River in Ohio, which is so polluted it last year literally burst into flames.

man bomb, and the question was how it should be reconstructed. A more spacious chamber, perhaps? One with a semicircular arrangement of comfortable chairs and useful desks, such as many of the world's parliaments enjoyed? Churchill thought not. What he wanted, essentially, was a replica of the old House with its rows of facing benches that symbolically expressed the party structure, emphasizing the contrasting roles of the Government and the Opposition. The new House, like the old, should have far fewer seats than there were members, so that in an ordinarily ill-attended session speakers would not be discouraged by addressing empty benches. On great occasions, members flocking in would be crowded standing in the aisles, thus encasing debate and decision with visible signs of gravity and urgency. No desks, for members might bang them as had the rowdy French whose parliamentary institutions, he did not need to recall, had proved less than stable. Churchill summed up these minutiae with a thought that is far from trivial, "We shape our buildings, and afterwards our buildings shape us."

Rare in our civilization are such instances where a public man (or, for that matter, a private man) evinces a thoughtful, constructive concern for the indirect human implications of material design. Yet how men deal with things—whether a room, a city, a river, or the great biosphere itself—both discloses and thereafter influences the way they see themselves and the way they deal with one another. Consciously or unconsciously, we make day-by-day decisions that affect the material world. These decisions have an immediate moral and aesthetic content that should be taken seriously, even if a deteriorating environment were not a long-range threat to prosperity, health, and the continuation of the race.

Survival is not the only—and perhaps not the most impelling—motive for environmental reform. People have a way of brushing off warnings that their farmlands, their lungs, and their life expectancies are being slowly eroded. The threatened penalties, though severe, seem to lie

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Fulfilling human wants

Discarded carcasses of automobiles line the banks of the Cuyahoga River (top) while in the photograph above a sludgy waterfall of taconite trailings spills into Lake Superior from the Reserve Mining Company's processing plant at Silver Bay, Minn. at the rate of 20 million tons per year. The company says the waste is harmless.

in the remote future. But inhabitants of drab and chaotic cities surrounded by a despoiled countryside are punishing themselves here and now not only by material disadvantages, but by the absence of a precious immaterial quality. Life is presently diminished, it loses point and relish and sense of direction when it is spent amidst a haphazard squalor that God never made, nature never evolved, and man never intended.

A youth smashes a window or sets fire to a house or mugs an old woman on a street. How much have we nurtured such disorders by the disorders of the American scene? It doesn't *look* as if anybody around here cared.

Although environmental issues do have a grave moral content, there's little sense in the tendency to present the case in the dominant art form of a TV horse opera. This isn't, really, a confrontation between "the polluters" and the good guys in the white hats. Nevertheless, casting for the villainous roles proceeds briskly. "Greed" is to blame. "Man, the dirtiest animal," is to blame, especially because his numbers are increasing. "Technology" is to blame—and this charge, as we shall see, contains much truth, though far less than the whole truth. "Capitalism" is to blame. "The poor," who throw garbage in the streets, are to blame. "Democracy," which seems unable to find remedies, is to blame. And, of course, "the establishment," everyone's goat of atonement, is to blame.

In general, the nomination of villains follows the familiar patterns of dumping the ashes of contrition on somebody else's head. A Columbia law-school senior this year was reported to have boasted that he told recruiters for law firms he "would not defend a client who was a polluter—and most of the clients who pollute are the big ones," a remark indicating that even law-school seniors may have something to learn.

For all men are polluters—and all living Americans are big polluters. The greedy and the ungreedy alike befoul the air with automobile exhaust fumes, the humble 1960 jalopy contributing somewhat more poison than the arrogant 1970 Cadillac. So long as our laws and habits of land use foster chaos, the homes of saints will aggress as rudely upon nature as the haunts of sinners. Who killed the rivers of Illinois by extinguishing perhaps forever their ability to cleanse and renew themselves? The effluents of big industries did a substantial part of the damage. Sewage from towns did part. But most of the damage to the rivers of Illinois came from farms onto which decent and well-meaning "little" men, in the pursuit of the legitimate aim of increasing crop yields, poured nitrogen fertilizers. The result bears the mellifluous name of "eutrophication": algae, slimy green gunk, rampantly feed upon the fertilizer drained into the rivers; the decay of dead algae consumes so much of the available oxygen as to destroy the bacterial action that once cleansed the rivers of organic wastes.

At the root of our environmental troubles we will not find a cause so simple as the greed of a few men. The wastes that besmirch our land are produced in the course of fulfilling widespread human wants that are in the main reasonable and defensible. Nor will we find capitalism at the root of the trouble. The Soviet Union, organized around central planning, has constructed some of the most terrifyingly hideous cityscapes on earth, while raping the countryside with strip mines, industrial pollutants, and all the other atrocities that in the U.S. are ascribed to selfish proprietary interests. Aware, as well they might be, of American environmental mistakes in handling the mass use of the automobile, Russians keep saying they will do it better; but today, as automobiles become more numerous in the U.S.S.R., it is hard to find in city or highway planning, in automobile design, or in any other tangible area signs that they are in fact better prepared for the automobile onslaught than the U.S. was in 1920.

The Japanese, though their basic culture lays great stress on harmony between man and nature, are not handling their environmental relations significantly better than the Americans or the Russians. Japan's economy, combining private enterprise with government central planning, seems able to do anything—except cherish the material beauty and order that the people value so highly.

If we wish to think seriously about the environment, we have to give up indulgence in barefoot moralism and the devil theory of what's wrong. We have to identify a root cause that explains the environmental failures of systems as different as the American, the Russian, and the Japanese. Obviously, all three are high-powered industrialized, technologized societies, and our quest for a root cause can start by tentatively picking technology as the villain.

Despite billions of words on the subject, we still underestimate the magnitude of technological advance and its implications. Thirty years ago architect and inventor of the geodesic dome R. Buckminster Fuller found an apt way of expressing what had occurred. He calculated the total energy generated in the U.S. as equal to the muscular energy that would be generated if every American had 153 slaves working for him. Today a similar calculation would indicate about 500 "slaves" for every American man, woman, and child.

These slaves enable us to increase our own mobility hundreds of times and to toss around incredible masses of materials, altering not only their location and external shapes but their very molecules. Excluding construction, earth moving, and many other operations, the U.S. economy, according to one estimate, uses 2,500,000,000 tons

produces wastes that besmirch our land

of material a year. That's nearly 13 tons per person.

These figures explain a lot of environmental woes that are otherwise mysterious. Although our cities are not more densely populated, they produce more maddening and wasteful congestion than any cities of the past. Our crowding is not basically a matter of too many human beings to the square mile but of the enormous retinue of energy and material that accompanies each of us. Like King Lear with his hundred riotous knights and squires, we strain the hospitality of our dwelling space, and from our situation, as from Lear's, much grief may follow.

Two hundred million of us are bustling about the U.S., every one sheathed in a mass-and-energy nimbus very much bigger, noisier, dirtier, smellier, clumsier, and deadlier than he is. The paper, plastics, scrap, ash, soot, dust, sludge, slag, fumes, and weird compounds thrown off by the mass-and-energy nimbus exceed by many magnitudes our own bodily wastes. If 10 thousand million mere people, sans technological nimbus, inhabited the U.S., they could not create more congestion, blight, and confusion. The 3,000,000 high-technology U.S. farmers put more adverse pressure on their land and rivers than the 150 million low-productivity peasant families of China put upon their land and rivers.

How should a city be designed and its circulatory system arranged to accommodate a people that employs energy and mass at present American levels? The past offers only wisps of inspiration, but no usable models. Consistently we have failed to face the sheer physical challenge of the contemporary city, assuming that old urban forms would be adequate if we amended them a little to meet one crisis after another.

Along with all kinds of congestion, our cities produce a paradoxical effect of isolation and desolation. Not rationally shaped for the needs of this society, the cities may be shaping us toward irrationality. Frequently mentioned in environmentalist circles these days is a research project carried out by John Calhoun at Bethesda, Maryland. He placed Norway rats in a closed area ample for the original population. As they multiplied, the crowded animals, though well fed, developed most distressing psychoses, which, out of a decent respect for the privacy of rats, will not be here detailed. Many who have heard of this project see a close parallel with our cities.

People who center their anxiety on "the population explosion" see the challenge much too narrowly. In the U.S. and other advanced countries, population has been increasing less rapidly by far than the explosive acceleration of the total energy and total mass deployed. If the population declined and technology continued to breed, without any improvement in the arrangements for its prudent use, a small fraction of the present U.S. population could complete the destruction of the physical environment while jostling one another for room.

The casualties of a withdrawal from technology would be heavier than many suppose. Everybody, of course, has his own examples of unnecessary technologies, unnecessary products, unnecessary activities. But because we are, thank God, diverse in our wants, the lists do not agree. The man who has since childhood said to hell with spinach has a ready-made response to the news that a high incidence of "blue babies" recorded in Germany has been attributed to heavy use of nitrogen fertilizer on the spinach crop. But other consumers will have good reasons for wishing spinach yields to increase. We will not improve our environmental situation by recommending a technological retreat on the basis of what each of us considers the superfluous items in the households of his neighbors.

To be effective in protecting the environment a technological retreat would extend over a wide front and go back a long, long way. A century ago we had already slaughtered the bison, felled the eastern forests, and degraded the colonial cities. Retreat to the 1870 level of technology, while not giving long-range protection to the environment, would place the median American standard of living far below the 1970 poverty line. Among the consequences of such a retreat would be the closing of 75 percent of the present colleges and most of the high schools. We would give up not only automobiles and airplanes but also mass education and social services. Grandpa would return to living in the abandoned hencoop.

Since we are not going to choose such a retreat from technology as a deliberate social policy, sheer practicality forces us to seek another way out. In that quest we have to ask seriously why the U.S. and all the other advanced countries have failed so dismally in handling the unwanted effects of technology.

Modern technology did not spring out of the void. It did not well up simultaneously in all the world's peoples. It appears first in European culture, and, although it is now disseminated over the whole globe, its main generative fonts remain to this day Western.

The Western origin and leadership in technology, the main agent of environmental destruction, inevitably raises uncomfortable questions about Western culture itself. The Judeo-Christian religious formation is not essentially "anti-nature," as some angry men now aver. But in contrast to Oriental religions, it does sharply separate its idea of God from its idea of nature and does look upon man as having a special relationship with the Creator and a unique place within creation.

The Western tendency to objectify nature—to see it "from outside"—is undoubtedly responsible for much arrogant and insensitive handling of the material world. But it ought not be forgotten that this same attitudinal "separation" of man from nature forms the basis of man's ever increasing knowledge of nature. In recent centuries, especially, Western man has empirically confirmed his ancient notion of himself as unique among the creatures: no other species possesses a glimmer of his ability to learn about nature and to operate, for better or worse, upon it.

Although this beach near Detroit, Michigan, on Lake Erie—environmentally the "deadest" of America's five Great Lakes—is clearly marked as unsafe, state authorities enforce rules against swimming in polluted waters loosely, if at all.

Surely it can be no accident that four centuries of science are attributable almost entirely to Western culture. Extending the pattern of Western religion and philosophy, which had drawn sharp distinctions between ideas of God, of man, and of nature, the scientific method began to separate one aspect of nature from another for purposes of study. This superlatively effective way of discovering solidly verifiable truths tends, precisely because it is sharply focused, to ignore whatever lies outside its periphery of attention.

Science, seeking only to know, is guiltless of direct aggression against the environment. But technology, devoted to action, feeds ravenously upon the discoveries of science. Although its categories are not the same as those of science, technology in its own way is also highly specialized, directed toward narrowly defined aims. As its power rises, technology's "side effects," the consequences lying outside its tunneled field of purpose, proliferate with disastrous consequences to the environment—among other unintended victims.

Modern Western man has advanced the principle of separation or differentiation also in areas of life, such as psychology and politics, that are

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seemingly remote from science and technology. These trends, too, have contributed to our environmental diseases.

The undifferentiated human mass, say of ancient Egypt, has been replaced by modern men who regard themselves—and in fact are—highly individuated. The long trend to individualism, which has Greek as well as Judeo-Christian origins, has sharply accelerated during the modern centuries. One of its aspects, democracy, is based on the assumption that the diverse wants, skills, interests, and opinions of individuals should not be ignored or rudely aggregated from above, but must be somehow coordinated from below. The latter process is clearly the more difficult, especially when applied to such large questions as how to protect the physical environment from human misuse.

The pharaonic society employed its most potent technology, irrigation, on the premise that everybody shared a common desire to eat. The knowledge required to operate the system was closely held in a group of priestly intellectuals, and the decision-making power was concentrated in the will of Pharaoh. With its technology under unified control, with few conflicts or complications arising from a diversity of skills, interests, rights, and powers within the community, the pharaonic society could maintain for centuries a stable, harmonious relation with nature and could also achieve stylistic and functional coherence within its man-made environment—such as it was.

One can hear today in environmentalist circles half-serious remarks that every city needs a king and every country an all-powerful planner to unify decisions affecting the environment. Such suggestions underestimate the human cost of the reversal, as do proposals for a retreat from technology. We will not voluntarily abandon the view that society should be made up of highly individuated men pursuing their own aims by their own lights.

We have permitted the free combination of individuals on the basis of shared specific aims. By means of such groups, mainly corporations, we have organized and stimulated technological advance, matching techniques to particular group aims. Though this pattern all too often ignores the undesirable side effects of its single-minded thrusts, it fits so closely with the evolution toward human diversity and freedom that we would shrink from a return to the pharaonic kind of harmony and stability. We are not fellahin, and the road back to that condition might be more arduous and more disorderly than the road we have traveled.

Western culture has never denied that a society stressing the individuality of its members needs the restraint and to some degree the positive leadership of government. But the character of government has also been affected by the trend toward differentiation. The Lord's annointed, with unspecified and even "absolute" power, has been split up into sharply segregated bureaucratic functions.

These, too, generate undesirable side effects. A highway department's mission is defined by statute and by specific appropriations. As it goes about its assigned task of building the most road for the least measured cost, it rips up neighborhoods and landscapes, creating enormous social disutilities that never get into the department's benefit-cost calculations. A sanitation department, told to dispose of garbage, may tow it offshore and dump it. When the refuse washes back upon the beaches and into the estuaries, the problem belongs to some other department. Or the specialists in solid-waste disposal may burn trash and garbage in places and in ways that transfer the pollution to the air.

Fragmentation of modern government occurs even in "totalitarian" countries. Administration of the Soviet economy is divided among 50-odd ministries for the sake of efficiency. If a paper mill is needed, the men told off for that responsibility look around, like any capitalist, for plentiful timber, plentiful water, and cheap electric power. One paper mill was placed on the shore of beautiful Lake Baikal because the protection of this unique body of water lay outside the field

Nature though uniquely diverse is still a unit

This carp, a hardy fish, died in the polluted waters of White Lake, Michigan, which is smothered on the bottom by sewage and strangled at the surface by sewage-fed weeds. One species of carp in Lake Erie, however, has learned to live on poison.

of assigned vision of the men in charge of paper production. They were not being "greedy" or even "stupid" in the ordinary meaning of those words. They were wearing the blinkers of concentration, using the great Western device of fixing attention on the job at hand, of dealing intelligently with one segment of reality at a time.

Though the principle of segregated attention proves gloriously successful—in research, in work, and in government—it can collide disastrously with the principle of unity. For each man is a unit though his skills and wants may be various. A society is a unit as well as a multitude. Nature, most marvelously connected throughout all its diversities, is a unit. Violation of these unities invites penalties and poses formidable tasks of reintegration.

Here we come to the root cause of our abuse of the environment: *in modern society the principle of fragmentation, outrunning the principle of unity, is producing a higher and higher degree of disorder and disutility.*

How can balance be restored? Since it is profoundly unrealistic to believe that we will or should retreat from such bastions of diversity as science, technology, and human individuality, then we have to seek improved methods of coordinating our fragmented thought and action.

During recent centuries, institutions of coordination, though lagging behind diversity, have not stood still. In economic affairs the market performs, albeit imperfectly, a stupendous job of mediating disparate wants, skills, resources. Government, amidst its bureaucratic fragments, has not completely lost the notion that it is supposed to serve such unitary purposes as "the general welfare." Specialized knowledge has a medium of transfer in the great modern webs of information, particularly the universities where all the sciences meet even if they do not fluently communicate.

How might such integrative agencies as market, government, and university be used, separately or in combination, so as to minimize the damage that fragmented action now does to the environment? This is the question on which the chance of actual reform, as distinguished from alarm and breast-beating, depends.

In two areas, air and water pollution, a moment's reflection should convince anybody that the market, as now set up, is rigged against the environment. A hundred and fifty years ago it was almost unimaginable that clean water, much less clean air, could become scarce in the U.S. economy. Rightly, these resources were then considered common property and used without charge. The price of everything else the economy uses —land, minerals, food, labor, time—becomes dearer. But clean air and water, though now precious, are still left out of the pricing system, still free of charge.

Because the market has failed to keep pace with changing economic reality, the pricing system, expressing relative demand and supply, works against the conservation of clean air and water. A manufacturer is under great pressure to offset rising labor and material costs by developing new techniques. He has been under no comparable pressure with respect to clean air and water. Not surprisingly, techniques for conserving these resources have developed very slowly. The effect of omitting free resources from the pricing system is to make the economy as a whole pay a huge subsidy to those activities that put above average pressure on free resources. In short, we are now providing a huge, unintentional market incentive to pollution.

The most direct and logical way of getting clean air and water into the market system is by a federal tax graduated in respect to the quantity and undesirability of the pollutants. Such a tax, escalating over the first five or 10 years so as not to destroy industries whose cost structures are based on the present system, would stimulate the development of antipollution techniques.

Taxes on the abuse of water and air would not replace the present trend toward stricter antipollution measures enforced by police power. Radioactive wastes, for instance, can be dangerous in very small quantities because they concentrate as they move up the food chain. The strictest control of such wastes is required—and may prove expensive. Nuclear power will be better able to absorb such costs if its competitor, fossil fuel, is forced to pay for the clean air and water it displaces. By such combination of government police power and taxing power we can turn the market toward protection of the environment—or at least achieve its "neutrality."

Correcting the market is much more difficult in that growing class of cases where the bad environmental side effects do not occur until the product is in the hands of the consumer or even until after he has disposed of it. It is by no means clear that automobiles, for instance, now carry taxes equivalent to the true social costs incurred by their use and disposal. If we become serious about the preservation or restoration of public transport in American cities the first step would be to make sure that public policy is not subsidizing the automobile.

Still more difficult to deal with is the product that is innocent until it interferes with some technique of protecting the environment. Many plastics give trouble in this indirect way. The polyvinyl chloride bottle causes no problems unless it is burned in a trash incinerator that is equipped with a scrubber designed to catch soot and fly ash. The burning PVC causes hydrochloric acid to form in the scrubber, destroying its metal casing. Some companies that hoped to sell more scrubbers for smaller incinerators have given up because they cannot guarantee their devices against the increasing incidence of PVC in trash. A small tax based on the nuisance side effect of certain plastics would either drive them off the market or encourage a new technology that abated the nuisance. As technology advances into more and more esoteric compounds, each carefully designed for a particular use, protection of the environment will require public policies that force innovators to pay more attention to the side effects of their products.

With gratifying frequency and emphasis, business spokesmen these days are expressing their determination to exercise greater care of the environment. If business greed lay at the root of our environmental troubles then this repentance would itself signal the great turnaround. In fact, a more sensitive and socially responsible business attitude will be of very limited help—unless it is accompanied by new ground rules. Under the present set of rules, if one corporation is environmentally a good citizen, incurring heavy costs to fight pollution, and if its competitor operates on an environment-be-damned basis, then the first corporation will be punished and the second rewarded. The market will practice selection against the environment.

Instead of getting on with the formidable job of rewriting the rules, public discussion wastes time and energy on irrelevant questions, such as how much of business profit should be diverted to environmental betterment. The problems have become so huge that we would not necessarily make a dent in them with *all* the profits of American business.

Henry Ford II in a speech late last year expressed this point cogently. He first noted that, "Hardly anyone disputes the proposition that service to society requires at least a short-run sac-

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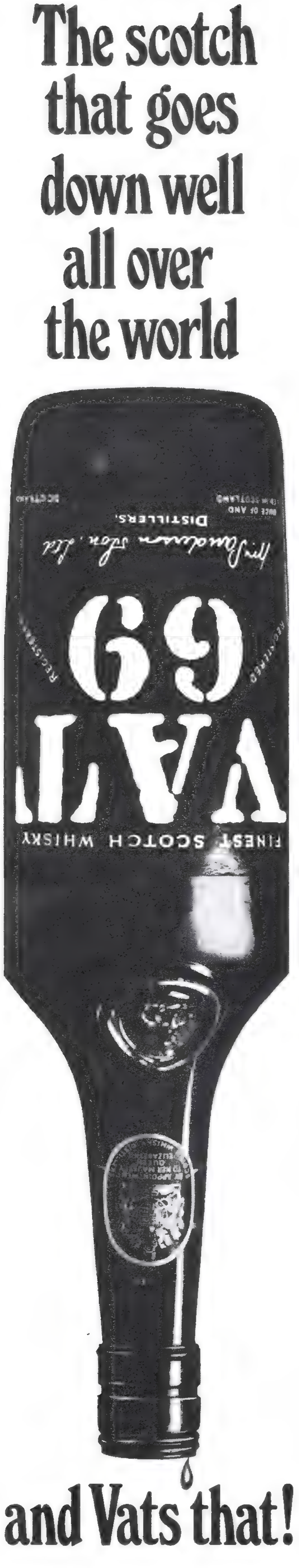

A shift begins from disjointed

rifice of business profit." Then Ford disputed that consensual proposition. "This point of view," he said, "may have been tenable in the past. As long as public expectations with respect to the social responsibilities of business were relatively narrow and modest, business could pass muster by sacrificing only a little of its short-run earnings. Now that public expectations are exploding in all directions we can no longer regard profit and service to society as separate and competing goals, even in the short run. The company that sacrifices more and more short-run profit to keep up with constantly rising public expectations will soon find itself with no long run to worry about. On the other hand, the company that seeks to conserve its profit by minimizing its response to changing expectations will soon find itself in conflict with all the publics on which its profits depend."

Ford recommended not a middle course but an entirely different approach. Instead of regarding profits as competing with public expectations, such as environmental demands, he argued that business should look upon the rising public standards as opportunities for profit. "We have to ask ourselves what do people want that they didn't want before, and how can we get a competitive edge by giving them more of what they really want?" Ford showed he was fully aware that in many cases governmental action would be required to translate the public's heightened desire for a better environment into effective market demand. New antipollution standards set by law, he said, had stimulated efforts by the automobile companies to reduce noxious emissions from cars.

Ford's and all other realistic approaches to environmental problems imply future government action very different in kind and quality from the typical bureaucratic methods of the past. Some businessmen's continued opposition to government action in protecting the environment can be explained—if not defended—on the ground that their past experience with government controls does not inspire confidence. Businessmen rarely contact "government" in any general sense. They confront one bureaucrat after another. Because the bureaucracy is even more sharply fragmented than business, there is often a good reason for a businessman to conclude that the typical bureaucrat's view of the general public interest is narrower than his own.

The beginning of a shift from fragmented to integrative government action can be illustrated by a brief look at the history of a field where concern for the physical environment and concern for the social environment overlap. Generations of indignation about "the slums" came to a head in the '30s. Crime, ignorance, disease, unemployment and, of course, poor housing were all among the reasons for anxiety. Governmental antislum action concentrated on one element, housing. Here was a material object that we surely knew how to produce in quantity. Without much study it was assumed that new public housing would somehow lever upward all the other adverse conditions of the slums.

So a large, competent, and militant bureaucracy was assembled on the narrow front of public housing. Over the years it went from triumph to triumph, if you measured by the size of the appropriation and the number of units built. People began to notice, however, that this program was not delivering, in human terms, what it had promised. The poor displaced by slum clearance were in many cases worse off than before. The new projects, more grim and sterile than the old slums, did not produce falling crime rates, better health, and improved school performance. Typically, the housing bureaucrats and their supporters brushed off these observations as inspired by reactionary politics and, inevitably, private greed.

A day came when the inadequacies of the narrow approach could no longer be ignored. More general terms, like "urban renewal," began to replace "slum clearance" and "public housing." In 1966 evolution of the governmental approach took a big step forward in the Model Cities program, which envisions a coordinated attack on such disparate fronts as medical care, educational enrichment, improved police work—and housing. Moreover, the Model Cities program calls for a decision-making structure in which people who live in the neighborhoods involved will have an important voice in determining what is done.

Because it runs against the familiar grain of fragmentation and bureaucratic control by the specialized experts, the Model Cities program breeds problems and conflicts. More accurately, it makes explicit and open those problems and

A tourist entering Tucson, Arizona from the north first sees this jumbled dump of cars. Tucson bills itself as the "oasis of the southwest."

acts to an integrated action

conflicts that the old public-housing approach, eyes fixed straight ahead, would have ignored. "The community," now assumed to have its own values about its living arrangements, has been given an integrative role; it is forced to think in terms of priorities and of the relationship between, say, health and education. As a decision-maker, the community sometimes asks questions that would not have occurred to experts working within discrete programs. The broad approach puts pressure on the social and environmental sciences to coordinate their specialized knowledge and to undertake investigations of what needs, in a practical sense, to be discovered.

There will be many cases where a high measure of integrative action can be achieved with government playing only a secondary, though necessary, role. One of the most fascinating innovations in protection of the environment is on trial just northwest of Baltimore, in the area formed by the Green Spring and Worthington valleys.

These 45,000 acres are inhabited by well-to-do and rich landowners who breed horses and cattle in one of the loveliest landscapes to be found in the U.S. The appearance of the valleys had changed little in this century, but the handwriting was on the hillsides. New highways had made the area more accessible to Baltimore. New real-estate developments pressed in from three sides. There was a wide and deep consensus among the area's 5,000 families that they would like to keep it the way it was. Despite their wealth, they doubted that they would be able to do this. Some landowner would sell to a developer. Reading this as the beginning of the end, another and another would sell. They would do so not out of greed, but because the system as it actually functioned seemed to give them no other real choice. Soon the valley floor would be covered. People who had paid premium prices to live "in the beautiful Green Spring Valley" would discover that they were living in a replica of 10,000 other undistinguished suburbs.

The valley landowners, banding together, sought advice from Dr. David A. Wallace, who had planned Charles Center in midtown Baltimore. To make an ecological study he called in Ian L. McHarg, (see pp. 30–32) a landscape architect out of the University of Pennsylvania. Together they worked out a "Plan for the Valleys," described as a chapter in McHarg's book, *Design with Nature*. The plan's most striking characteristic is its contrast to the purely negative approach of most conservationists. It accepted change for the area not only as inevitable but as socially desirable. Wallace and McHarg, estimating that unplanned development would generate $33,500,000 in profits, sought to devise a way of orderly development that would add as much.

The unique aesthetic asset of the area was the pastoral scene on the valley floors. There, housing subdivisions would be prohibited. Development could occur in rather dense clusters on some of the area's plateaus, now sparsely inhabited. Within 30 years, population of the area might rise from 17,000 to 110,000 or more. By 1980 more than $40 million would be added to total value.

The big jump, of course, would be in the price of development land on the plateaus. The plan calls for some of this profit to be piped down to the valley-floor owners whose abstention from sales to developers would cause the price rise on the plateaus.

Whether this plan will work remains to be seen. But it is the kind of effort that should provoke study all over the U.S. The essential elements of the plan are (1) the wishes of the private owners; (2) their recognition that the housing needs of other people require great change in the area; (3) the combination of ecological and socio-economic planning principles; and (4) support of the plan by government.

"Plan for the Valleys" runs counter to many ingrained ideas of "absolute" private-property rights and untrammeled market action. The main purpose of institutions based on these ideas is to widen freedom of choice. As our technological power rises it becomes more and more obvious that the use and value of one man's land depend on what his neighbor does with his land. If this new reality is not reflected in our laws and other social institutions then actual freedom of choice diminishes. The wholesome "fragmentation" represented by private landownership will defeat itself in the absence of balancing institutions that can coordinate social action in respect, say, to the preservation of a beautiful environment, a unity that gives value to the ownership of its parts.

Multiplication of laws setting forth what can't be done will be ineffective unless we invent legal, economic, and social devices through which we can decide what *should* be done. In the absence of such decision structures few people will ever develop Winston Churchill's sense of the connection between material design and human purpose.

Compare the constructive principles of the "Plan for the Valleys" with the negative and accusatory tone of much recent discussion. At a meeting in New York early this year, various environmental ills, including the appalling mess of the Jersey Meadows, were excoriated. Said one of the guests, a businessman: "Jersey Standard's officers should have been shot for putting a refinery there in the first place." Another guest asked: "Where should they have put it—in the Rocky Mountains?" The businessman was appalled by this sacrilegious suggestion, but he refused to deal seriously with the question of a refinery's location.

So do most conservationists. Everybody wants ample electric power, for instance, but more and more communities are prepared to resist the presence of a power plant. Decisions on plant location are being made in a basically disorderly way with each fragmented community interest in turn poised against the fragmented interest of the power company. More and more of these cases are getting into courts. But the courts, operating in the narrow dualism of adversary proceedings, are hardly in a position to say where a power plant ought to go. In this decision system the most apathetic or careless community would get stuck with the power plant or refinery—and this might be exactly the worst place to put it from either a business or an environmental viewpoint.

Obviously, a high-technology society needs, and its government should provide, forums for the rational resolution of such questions. Carl E. Bagge, a member of the Federal Power Commission, argues that regional planning bodies should become the forums for deciding on such questions as the location of new power plants and power transmission facilities.

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FRAGMENTED POWER

Better handling of the environment is going to require lots of legal innovation to shape the integrative forums and regulatory bodies where our new-found environmental concerns may be given concrete reality. These new legal devices will extend all the way from treaties forbidding oil pollution on the high seas down to the minute concerns of local government. But the present wave of conservationist interest among lawyers and law students does not seem to be headed along that constructive path. Rather, it appears intent on multiplying two-party conflicts between "polluters" and victims.

When we read of some environmental atrocity—a sonic boom, a baby bitten in a rat-infested slum, a disease caused by polluted air—our sympathies instantly go out to the victims, just as our sympathies go out to those hurt in automobile accidents. This example should give us pause. The damage suit as a legal remedy in automobile accidents has clogged the courts and imposed on the U.S. public a $7 thousand million annual bill for liability insurance premiums. This huge cost contributes almost nothing to highway safety. For a fraction of the dollars and the legal brains drained off by damage suits we could have produced better highway codes and better regulations for car safety—and also provided compensation for the victims of a diminished number of accidents. If environmental law follows the dismal pattern of automobile tort cases, every business and perhaps every individual will be carrying insurance against pollution-damage suits. An army of pollution chasers, hot for those contingent fees, will join the present army of ambulance chasers. None of that is going to do the environment any good.

Now we need environmental integrators

This is not intended to suggest that environmental tort cases should have no place in future law. It is meant to express the hope that such suits will be exceptional and the main line of legal development in respect to the environment will break (if conservationists can forgive the metaphor) new ground.

The web of communication could do a much better job than it is doing in helping to coordinate society's fragmented actions. Journalism, enslaved to its outworn traditions, is eager to report those environmental concerns that are reduced to simple and dramatic "confrontations," but journalism is insensitive to the complexities of city planning or of market reform to reduce pollution.

A key contribution to the environmental future can be made by the university, the most significant institution in the whole communication network. Indignation concerning the environment is now at a very high pitch among students and faculty. Not all of this emotion, however, is translated into efforts within the university to balance specialized fragmentation with integrated studies.

An interesting view of faculty attitudes toward the environment was elicited from Robert Wood, Undersecretary (and briefly Secretary) of Housing and Urban Development in the Johnson Administration and now director of the Joint Center for Urban Studies of M.I.T. and Harvard. On his return to academia, Wood found that, throughout the faculties, interest in environmental affairs had suddenly become emotionally intense. "They are a little like the atomic scientists after Hiroshima," he says. "They had assumed that science was automatically improving the world. Confronted with contrary evidence, they feel guilt. But they tend to become impatient when their condemnations of what is happening are not immediately followed by correction."

Many faculty members who are most indignant about the environment would be unwilling to direct their own research or teaching effort to environmental questions. Urban-affairs centers and institutes of ecology are proliferating on campuses but in many cases they are not allowed, because of the jealousy of the entrenched disciplines, to give credit courses or degrees. In the academic structure, such interdisciplinary institutes are looked down upon much as a mongrel would be regarded at a show sponsored by the American Kennel Club.

U.S. society is going to need tens of thousands of "integrators," men who can handle environmental material from several natural sciences in combination with material from several of the social sciences. These men will utilize very high technologies, such as computers and space satellites, to diagnose and cure the side effects of other technologies. Tomorrow's integrators, moreover, must be able to deal with broad questions of human value, purpose, and law that lie beyond (and between) the sciences. The universities that produced the specialists who taught us how to take the world apart will now have to train the men who will take the lead in putting it together again.

Environmental damage is so widespread and is continuing so rapidly that there is a serious question as to whether we can afford reform—a question that is not necessarily answered by the glib truth that we cannot afford to go on as we are.

If certain 20th Century trends such as population growth and, especially, the enlargement of the per capita mass-and-energy nimbus are simply extrapolated into the future, it's obvious that at some point we will destroy ourselves by consuming the earth. But these rates may not soar on forever. After 10 years of falling U.S. birthrates, it has become possible to believe that the U.S. population may stabilize between the years 2000 and 2020 at not much above its present level, as a few demographers have predicted.

Limits of growth are also in sight for the more important rate of mass-and-energy used. The heavy environmental pressures come from agriculture and manufacturing (including mining). We are already producing more food than we consume and more that we would need to feed all the hungry in the U.S. The total value of manufactured goods will probably continue to rise for several decades, although substantial reductions in this demand could result from better environmental policies. Many things (*e.g.*, the second family car, the second home) that we now buy are made "necessary" by wasteful environmental arrangements. The U.S. will probably reach saturation in manufactured goods in any event at some point in the next 50 years, if only because the time to use all the things we buy is becoming scarce.

Meanwhile, this economy will be very hard pressed to keep up with its increasing needs on the "services" front. A society that is both highly specialized and rapidly changing requires, as ours has already demonstrated, an elaborate "nerve system," employing millions, to maintain its cohesion and determine its direction. Among the elements of the "nerve system" are education, communications, law, finance, etc., which burn little fuel and consume small tonnages of materials.

The probability that gross pressure on the environment is due to stabilize does not of itself constitute a ground for optimism. It merely indicates that our prospect is not hopeless, and that by a huge and intelligent effort we might reverse the present devastation.

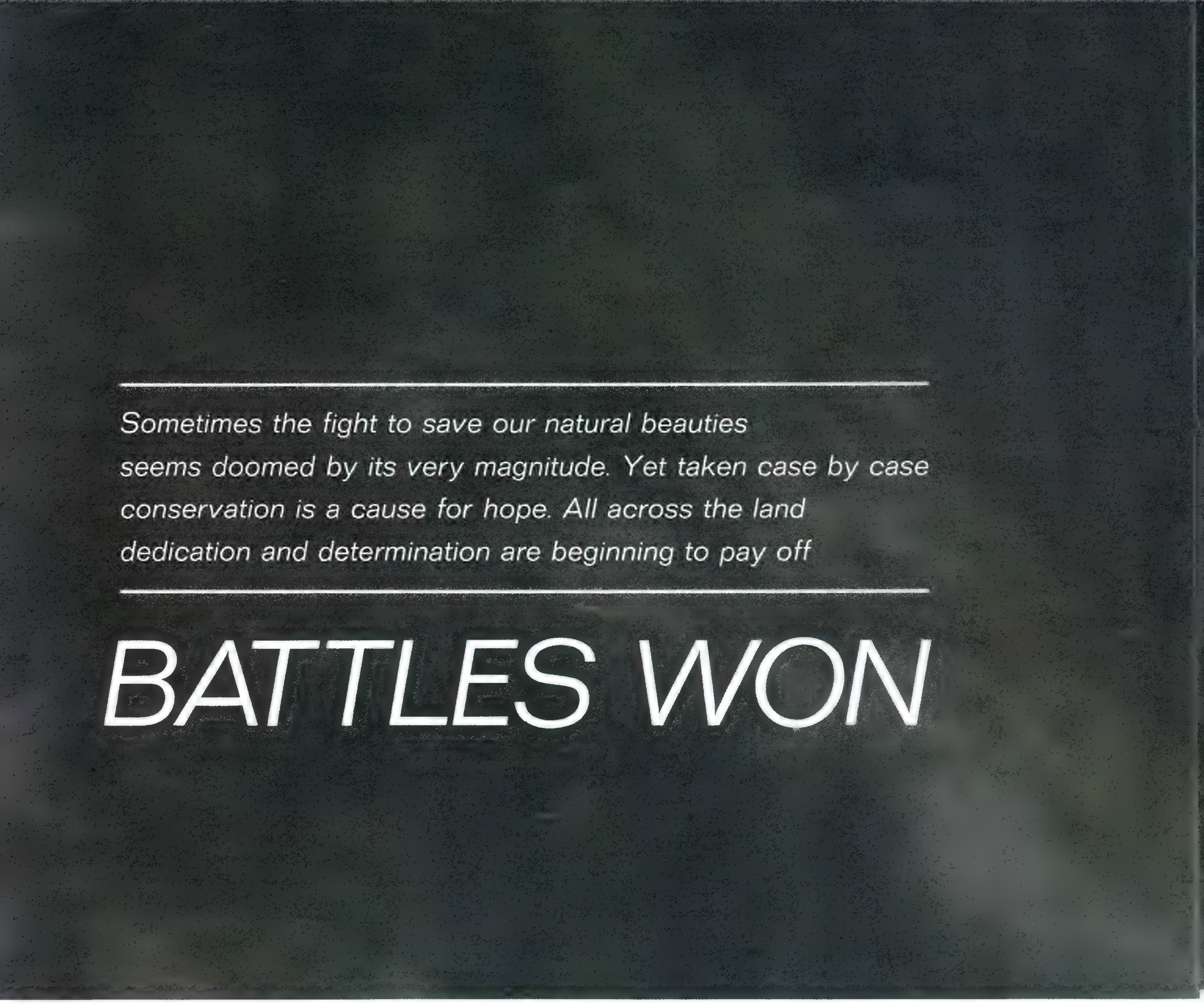
Whether that effort will be made depends primarily on how we think about the challenge. We did not get into this mess through such vices as gluttony, but rather through our virtues, our unbalanced and uncoordinated strengths. If we do not succeed in bringing under control our new-found powers, the failure will be attributable to the father of all vices, inattention to the consequences of our actions.

Modern man, Western or Westernized, is not going to snuggle back into the bosom of nature, perceiving all reality as a blurred continuum. That possibility of innocence we lost long ago in—of all places—a garden. We have understood differentiation, specialization, individuation; we have known the glories of action concentrated upon a specific purpose. Our path toward unity lies *through* diversity and specialization, not in recoil from them. A high-technology society without adequate institutions of coordination will produce either chaos or tyranny or both. Freedom will become meaningless because individual men will cease to believe that what they want has any relevance to what they get. But a high-technology society that can innovate adequate structures of decision will expand the freedom of individual choice far beyond any dream of the low-technology centuries.

The chief product of the future society is destined to be not food, not things, but the quality of the society itself. High on the list of what we mean by quality stands the question of how we deal with the material world, related as that is to how we deal with one another. That we have the wealth and the power to achieve a better environment is sure. That we will have the wisdom and charity to do so remains—and must always remain—uncertain. ■

From left to right :
MARTINI & ROSSI "Tonic" : In a tall glass, one measure Martini & Rossi Sweet over ice. Fill with tonic water, add lemon slice.
MARTINI & ROSSI "On The Rocks" : Over ice, pour Martini & Rossi Sweet. Add twist of lemon.
MARTINI & ROSSI "Formula 2" : Over ice, pour 2/3 Martini & Rossi Sweet vermouth. 1/3 Martini & Rossi Extra-Dry vermouth. Juice of 1/2 grapefruit. Dash of tonic water. 1 slice of orange. 1/2 slice of grapefruit. 1 slice of lemon. 2 maraschino cherries.

Acapulco, Mexico.
Photographer : Art Kane.



Sometimes the fight to save our natural beauties seems doomed by its very magnitude. Yet taken case by case conservation is a cause for hope. All across the land dedication and determination are beginning to pay off

BATTLES WON

Wood family flanks conservationist Ted Steele (fourth from left)

Aravaipa Canyon is a place where saguaro cactus and prickly pear march across the rims, hawks float in the updrafts, cougars and bobcats and ringtail cats patrol the dusty ledges. So it has always been. And now, for as long as the conservationists' money flows and the creeks don't rise, so it will always be, preserved as a living museum of the canyon-and-rimrock country of the Southwest. It is a conservation battle won, one of a number of such victories across the country. The canyon walls rise on 4,400 acres ranched for years by the Wood brothers, Fred and Cliff, in southern Arizona. The ranch was purchased by conservationist Ted Steele ("The environment is like a religion to me") on behalf of the Nature Conservancy, an organization whose function is to hold the land in trust until a buyer who will preserve it can be located. Steele hopes to raise $1.5 million to finance the purchase—a new battle. Choosing what to save and what to spend among our still-plentiful natural beauties is never easy, and making a preservation decision stick is more trying still. Each threat means a fresh fight. To lose is to lose for good.

Photographed by GEORGE SILK

A turkey vulture glides between the walls of Aravaipa Canyon

Rocks and desert plants line the canyon rim

Lawyer Daniel Paul and conservationist Joe Browder

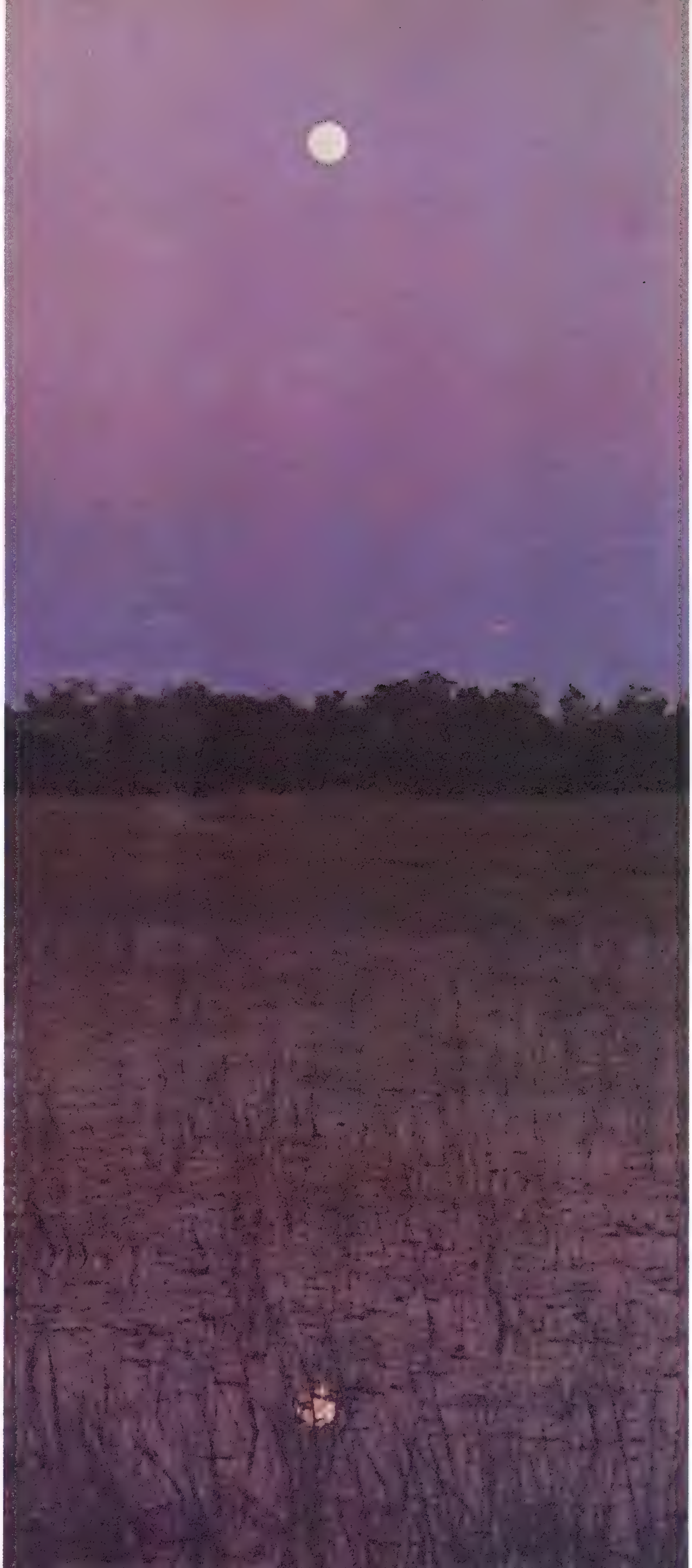
"First it was the Corps of Engineers," the Everglades boatman said, "building those dikes across the river of grass. Then it was the jetport people messing with Big Cypress Swamp. Now it's oilmen tearing up the Buttonwood Heads and them developers wanting to drain Gum Slough. Why can't they leave the country alone?" The country is the sawgrass and swamp of southern Florida, part of which is the Everglades National Park. A broad, watery plain, it depends almost entirely on rainfall for its fresh water and it is threatened by any interference with the overland flow of the water. Six months ago, with a White House announcement scuttling plans for a major international jetport

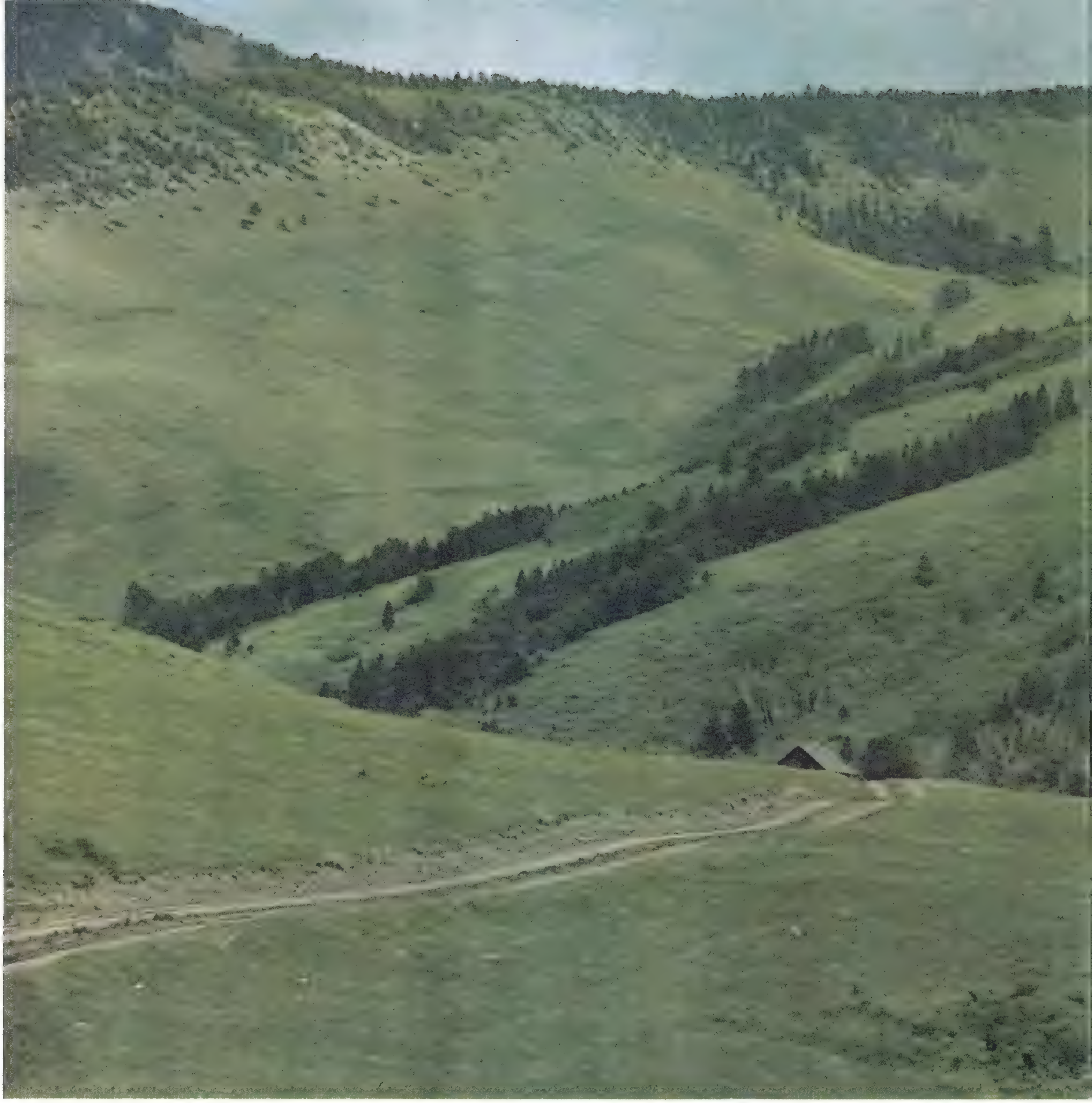
In Gum Slough, north of the Everglades Park, a westering sun throws light across the

The endless wetlands of the Everglades

north of Everglades Park, the conservationists won a great and famous victory, a victory which seemed to signal a turning point in the public attitude on conservation *vs.* development conflicts. Conservation activist Joe Browder of the National Audubon Society and attorney Daniel Paul of Miami led the battle against the 39-square-mile airport. But Browder knows that more must be done. "The jetport issue," he says, "was only one in a series of annual Everglades crises. Nothing has been done to correct the system that produces the crises." Most of the swampland north of the park is privately owned, and in recent months both oilmen and commercial developers have been at work there.

waters (above) that the moon turns to magenta (right)

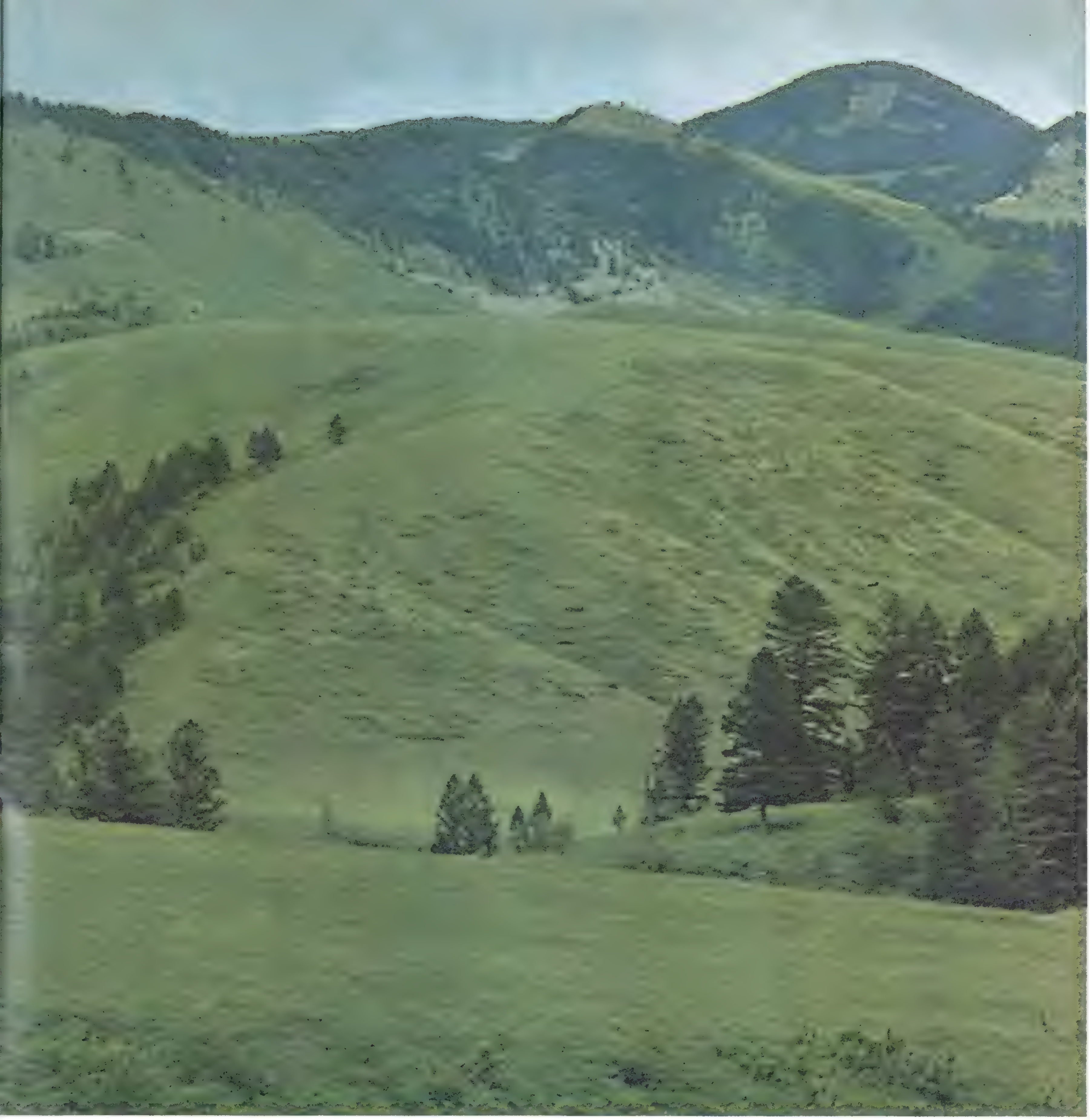




Formerly Beartooth Ranch, these rolling mountains in western Montana are now part of Beartooth Game Range

A stretch of Montana where elk can roam

A lot of college students talk about ecology, but few have the opportunity presented to 20-year-old Bill Milton and his brothers and sisters: a 27,600-acre ranch along the Missouri River in western Montana, spreading through mountains, high meadows and forest. Lewis and Clark stopped there en route west, explored a Missouri tributary and named it Elkhorn Creek. The children spent summers there, and inherited the ranch four years ago when their father died. The executor of the estate put the ranch up for sale. The more Bill thought about it, the more he liked the idea of making it an elk preserve. Last fall he learned of the Nature Conservancy, walked into



the office of Western Regional Director Huey Johnson and blurted an offer: "I'll give you my ranch." It wasn't that easy. Johnson offered to buy, but first a previous buyer located by the executor had to be pacified. Then the Montana Fish and Game Department agreed to buy the land for a game preserve. The heirs demanded, and got, a strict clause forbidding damaging recreation use. By next year, all the cattle will be gone and what wildlife experts call "an ideal big-game range" will be home to elk, deer and other species. The students gained from the experience as well. "When you can make decisions like that," Bill says, "you're in a very heavy position."

Students Al Otto, 21, Bill Milton, 20, Jim Milton, 17

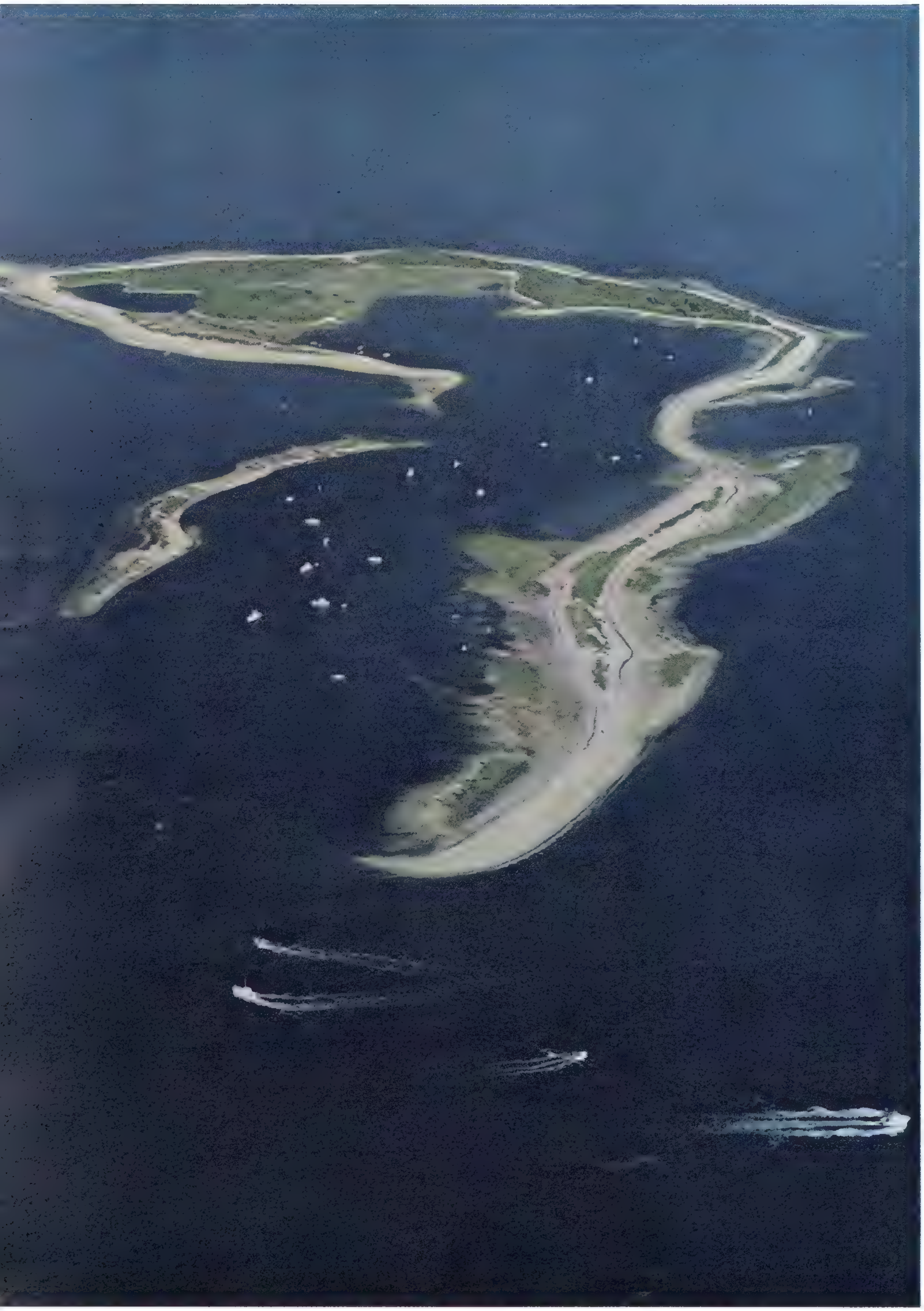
Most of McDonald's Wilderness is covered with brush or trees

Home for a warbler in the heart of Texas

"For sale," the ad read, "land maintained by owner more than 30 years as a wildlife sanctuary. Land never grazed. Rugged—canyons, small valleys . . . Spanish oak, elm, cedar, columbines, dogtooth violets . . . 300 acres wilderness land uncleared except for trails." The seller was Texan R. E. McDonald, and the sale was necessary, he said, to meet "the cost of growing old." McDonald's piece of the Texas brush country is home to the golden-cheeked warbler, a tiny, rarely seen bird which nests exclusively in Texas. His ad interested the local Audubon Society as well as developers, but the society lacked the funds to buy it. At that point four friends teamed up to purchase it. Ultimately they hope to make it part of a university-sponsored "Texas System of Outside Laboratories." Old McDonald (now 87) is for it. "There's too much ignorance about nature."

R. E. McDonald (left) and bird expert Edgar Kincaid enjoy the shade

A rarely photographed golden-cheeked warbler in one of McDonald's Spanish oaks


Cockenoe Island in Long Island Sound is now a park

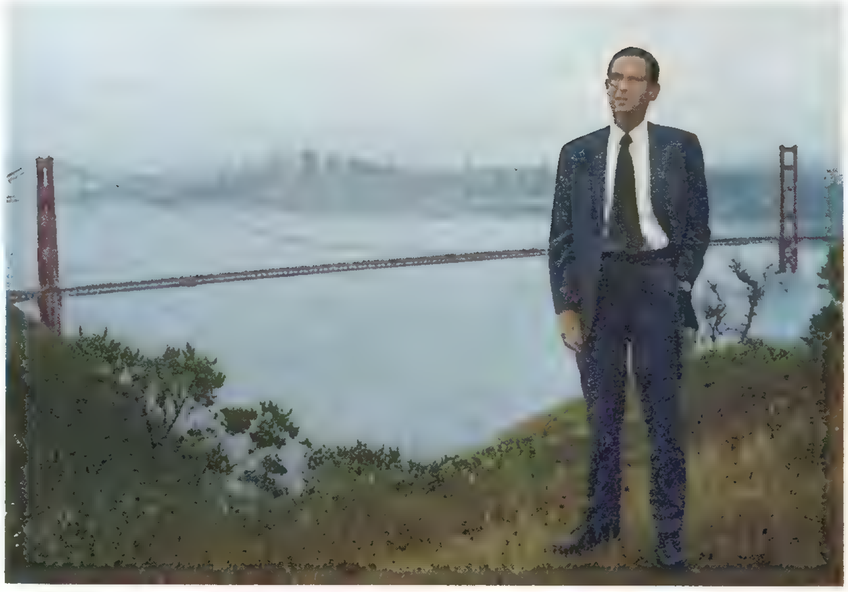
Mrs. Jo Brosious

An old road winds to the 19th Century Haley Farm in eastern Connecticut

Two precious parcels of Connecticut

Connecticut is an older frontier, a gentle place of second-growth woods and shore and ponds, of soft hills and stone walls and tidy farms. But when the whine of the 20th Century gets too shrill along its 18th Century lanes, and any of its quiet beauty comes under siege, Connecticut can fall back on another natural resource—aroused ladies. Mrs. Jo Brosious set out to save Cockenoe Island, a 26-acre chunk of sand and brush 1,000 yards off Westport. The island, long a fishing and recreation site for town residents, four years ago became the property of a power company that wanted to build a nuclear plant there. Mrs. Brosious trumpeted the alarm in the weekly paper she edited, gathered a "petticoat press corps" of women supporters, and led 400 townspeople to Hartford to pressure legislators. A year ago the power company relented and sold the island to the town as a park. "We fought," Mrs. Brosious explains, "on the issue of whether a utility or the people have the right to determine land use. And we won." Over in Groton, meanwhile, Mrs. Claiborne Van Zandt had another cause—Haley's Farm. A meandering 264 acres of meadows, ponds, orchards and pasture, the farm was being eyed by a real estate developer. Mrs. Van Zandt rallied local resistance for two years, raising money with everything from a rock concert to a save-the-farm smorgasbord. The state, bolstered by a $150,000 federal grant and the $50,000 raised by Mrs. Van Zandt, finally purchased the farm as a park for $300,000. She wants it maintained as farmer Haley knew it in the 19th Century—"a place where people can watch hay taken in, steal apples, see a real farm at work."

Mrs. Claiborne Van Zandt



Ex-newsman Joe Bodovitz fought plans to fill San Francisco Bay

A curlew probes the shallows

Marsh grass ripples at Tubbs Island sanctuary

That grass may grow by San Francisco Bay

A generation ago, in a more innocent time, a San Francisco disc jockey named Red Blanchard amused his listeners by inviting them to "fill up the bay—send an envelope of dirt to this station." Since then developers have turned Blanchard's whimsical advice into sodden fact: the original 700-square-mile surface of San Francisco Bay has been systematically reduced to 400 square miles, threatening the chain of life dependent on the bay and its fringe of estuarine marshland—fish, plants and shorebirds. Five years ago the conservation counterattack began. Emulating Red Blanchard's plan, conservationists deluged legislators with bags of sand tagged, "You'll wonder where the water went when you fill the bay with sediment." The result was creation of the Bay Conservation and Development Commission, with ex-journalist Joe Bodovitz as director. The commission lacks both the power of eminent domain and money to buy land. Enter the Nature Conservancy, which last year purchased a 330-acre sanctuary at Tubbs Island. Purchase of the land, which is rich in the estuary grasses that provide a bountiful larder for fish and birds, was a reprieve for both wildlife and man. "The pressure to fill it is more intense than ever," Bodovitz says, "but the bay has been given a chance to live."

Brooklyn's own magnolia tree

The tree is a botanical freak. It is a Southern magnolia, and nowhere is it written that Southern magnolias thrive on Brooklyn streets—they are rarely found north of Philadelphia. Nevertheless it has been there for 85 years and is there still, thanks to a 70-year-old grandmother named Mrs. Hattie Carthan. An urban renewal project would have endangered the tree by tearing down two brownstones that shielded it from the wind. Mrs. Carthan initiated a raffle—"We had to call it a drawing because of the children working in it"—and raised $7,000 for a protective wall. Two months ago the city designated the tree a "living historical landmark" and ordered its protection. "Saving the tree is beautiful," Mrs. Carthan says. "I'm old and I'm tired, but I can't turn my back on trees—they're too important."

Mrs. Hattie Carthan and friends with their magnolia

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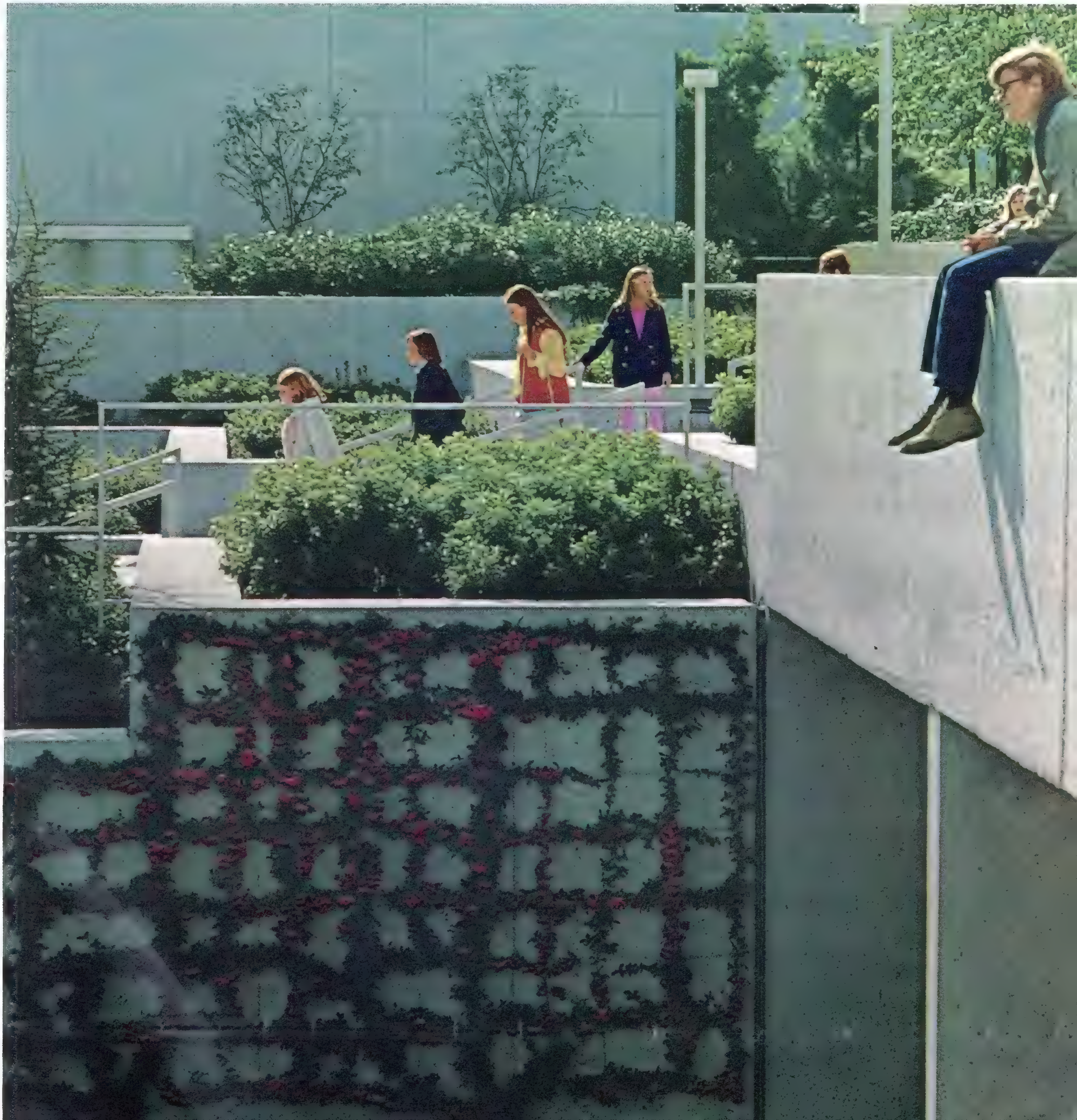
Buildings Can Be Beautiful Too

A happy combination of visual pleasures comes to Oakland, Calif. with the building of a new museum which, because it is mostly constructed beneath ground level, is brilliantly unpretentious. Aboveground, three elegant concrete chambers open onto landscaped terraces for sunning and sitting.



Urban dwelling at its most urbane

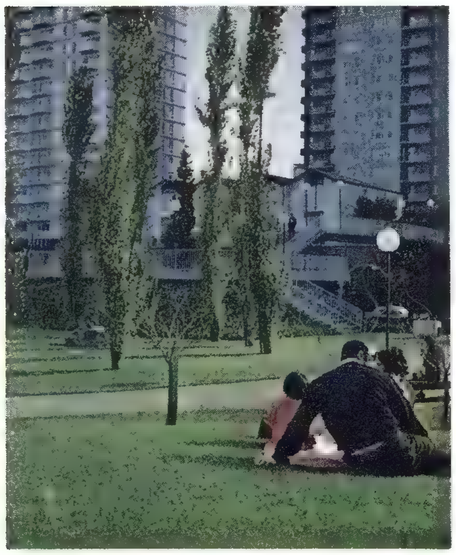
In America the found environment obviously does not have as much future as the environment man makes for himself. So it is fortunate that a body of specialists in environmental design is at work and flourishing. These men are architects, landscape architects, planners, and engineers, to whom private clients or city governments can bring whole packages of problems and possibilities.

When working in the countryside, the professionals' most pertinent talent is often that of tact, of not trying to put nature down. Like farmers, they can sometimes actually increase the appeal of a landscape by domesticating it a little, but rarely by trying to use lyrical natural surroundings as a stage set for a man-made climax, a castle on the Rhine. Instead, the houseboats using the Seattle shore front in the photograph at far right are casually polite to the water view, deferring to it.

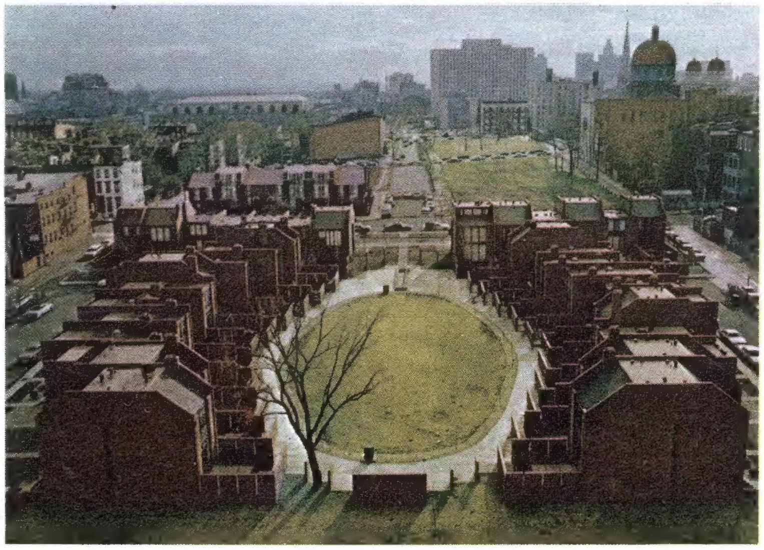
The most difficult work lies in the cities, and there tact is not enough, of course. Nobody ever won an argument with a New York taxi driver without assertion and wit. Ingenuity and the ability to protect oneself help too. The large photograph at right shows a state-aided housing project located in New York's Harlem, which looks inward and toward the Harlem River to give its tenants some privacy. But it doesn't turn its back on the rest of the city. So too with the rows of town houses, below on the facing page, in an urban-renewal area in Baltimore, another self-contained little community that takes pleasure in the bigger city as well. The scattered parks, the roads, playgrounds, and the other isolated nooks and crannies of created quality in our environment share one characteristic. These places have calmness and quietude proceeding from a sense of order. They avoid ostentation, and, moreover, usually wear a touch of visual wit. That these effects can be achieved so unpretentiously does not mean that they do not demand highly professional skill. It is a skill we will need more of in years to come.

Adapted from FORTUNE

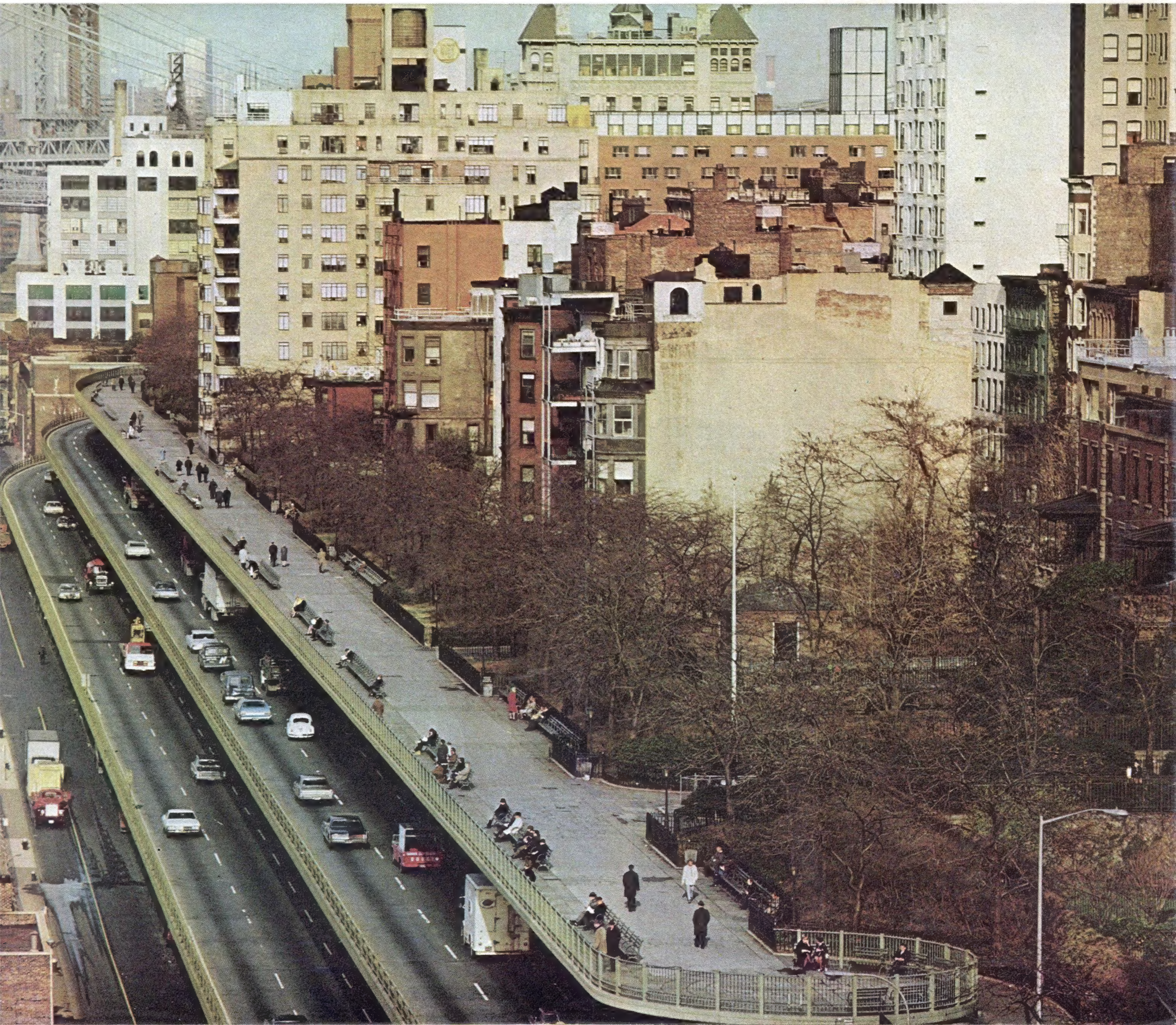
Relief valves for urban pressures, small parks can create recreational space in valuable midtown real estate. At left, below, loungers sit amid the skyscrapers of the Golden Gateway development in San Francisco, while at right sun-worshipers enjoy Paley Park in New York City.



Distinctive housing at a modest price can result from good design. At Riverbend Houses, the cooperative development pictured at left, open galleries give each apartment a front porch and front door, all at a price of $414 per room. A houseboat community in Portage Bay (top), 10 minutes from downtown Seattle, Washington, is somewhat reminiscent of the cluster of nautical dwelling places near Srinagar in Kashmir, and for $25,000 gives each tenant his own home and mooring, designed by his choice of architect. St. Francis Square in San Francisco, California (above), consists of a series of courts surrounded by 299 low-cost cooperative apartments sponsored by the International Longshoremen's and Warehousemen's Union. On Bolton Square (below), handsome new-style row houses in Baltimore, Maryland, enclose a common. They cost $22,000 and up.



Although freeways are abominations in the minds of many environmentalists, the Junipero Serra Freeway (above) does such a sympathetic job of undulating through the farm and estate country of the San Francisco peninsula that it almost becomes a park in itself. A more emphatic solution is the Brooklyn-Queens connecting highway (below) in New York City, which had to press through a heavily populated area. Instead of cutting a swath through the district's beautiful old houses, the engineers built retaining walls and cantilevered the freeway out from them, saving the road underneath. Then they topped off with a brand-new public park and promenade.



Photographed in Taipei

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